INFORMATION REPOSITORY
for
BAINBRIDGE ENVIRONMENTAL ACTIONS

GENERAL INFORMATION

This collection of documents has been assembled so that the general public will have the opportunity to review and comment on proposed environmental cleanup actions at the former Naval Training Center, Bainbridge, which are governed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Decision documents such as the Action Memorandum and Engineering Evaluation/Cost Analysis (EE/CA) are provided specifically for the information, review, and comment of the public. Other documentation, such as the Remedial Investigation, Feasibility Study, the Hydrogeological Investigation, Contractor Close-Out Reports, the Environmental Baseline Survey (EBS), Finding of Suitability to Transfer (FOST), and copies of correspondence, are items which have influenced the actions proposed and taken, and are provided here for reference.

This information repository has been compiled, and will be maintained, by the Navy's Engineering Field Activity, Chesapeake (EFA-Chesapeake), until all CERCLA related actions have been substantially completed at Bainbridge. Information on actions that are not governed by CERCLA, such as demolition of asbestos-contaminated buildings, or property transfers, will not be maintained here. Further information on non-CERCLA items may be obtained by writing to the Navy at the address that is listed below, or by phoning 202-685-3243.

The information repository will be updated periodically, as additional information becomes available. If you wish to check for recent additions, they will be annotated on the Change Register that follows this page. You may submit your comments by writing to:

EFA-Chesapeake
Bldg 212, Code 181
901 M Street, S.E.
Washington, D.C. 20374-5018

Questions on CERCLA-related issues may be phoned to 202-685-6293.

The US Environmental Protection Agency and the Maryland Department of Environment are Federal and State regulatory agencies involved with the environmental cleanup actions at NTC-Bainbridge. Their mailing addresses and telephone numbers are:

US EPA Region III — 215-814-5129
Federal Facilities Branch (3HS13)
1650 Arch Street
Philadelphia, PA 19103-2029

Maryland Department of Environment — *410-631-3440 or*
Waste Management Administration — 1-800-633-6101, x-3440
2500 Broening Highway
Baltimore, MD 21224

CHANGE REGISTER

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CORRESPONDENCE UPDATE (SECTION 5)		12/16/94 KRA
Correspondence, Index, added Action Memo		05/18/98 JL
Correspondence	(Book I, Tab 4)	7/19/99 NP
RI Report	Books VII & VIII	7/19/99 NP
Work Plan Addm.	Book IX, Tab 3	7/19/99 NP
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Draft FS	Book XIV	7/19/99 NP
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Human & Eco Risk Assess.	Book XIII, Tab 5	8/5/99 NP
Action Memo	Book I, Part d	10/5/99 N.P.
Update RBCs	Book I, Tab 2	10/5/99 N.P.
Correspondence	Book II, Tab 4	10/5/99 NP
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Added Figures to Risk Assess. Summary	Book XIII, Tab 3	10/5/99 NP
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Eco. Assessment using RBP	Book XIII, Tab 6	10/5/99 NP
Final FS	Book XIV	10/5/99 NP
Proposed Plan	Book XV	10/5/99 NP

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FINAL ROD + RESPONSE TO COMMENTS	BOOK XV, TAB 2	2/17/00 CMH
FINAL FOST + RESPONSE TO COMMENTS	BOOK XV, TAB 3	2/17/00 CMH
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INFORMATION REPOSITORY
for
NTC-BAINBRIDGE

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DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY CHESAPEAKE
WASHINGTON NAVY YARD BUILDING 212
901 M STREET SE
WASHINGTON DC 20374-5018

IN REPLY REFER TO:
APR 2 1998

ACTION MEMORANDUM

DATE: 30 Mar 98

FROM: Frank Peters, Code 181, Engineering Field Activity, Chesapeake, Naval Facilities Engineering Command

TO: Commanding Officer, Engineering Field Activity, Chesapeake, Naval Facilities Engineering Command

SUBJ: TIME CRITICAL REMOVAL ACTION

1. PURPOSE

This action memorandum describes a time critical removal action undertaken under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 40 CFR 300.415. The removal action addresses PCB Spills at Buildings 628 and 693 (collectively known as Site 04), at the former Naval Training Center (NTC) Bainbridge, MD. The removal action includes the areal delineation of contamination, cleanup of the PCB contamination from soils and concrete surfaces, off-site disposal, and confirmation sampling.

2. SITE DESCRIPTION

a. Background. NTC-Bainbridge was constructed and activated during the early 1940s as a training center for recruits during World War II. Following the war, the 1,200 acre base went through one of several periods of reduced activity; during the Korean conflict, training at the NTC increased. At various times, the mission of the NTC changed to meet the changing needs of the Navy. During the late 1960s, the base again entered a period of reduced operations, and on June 30, 1976, the Naval Training Center was formally closed as a Navy installation.

From the late 1970s until 1990, the US Department of Labor operated a Job Corps training center on a portion of the Navy property. Selected Navy buildings were used as classrooms and dormitories for Job Corps trainees, and utility services such as sewage treatment, water and electrical distribution were provided through Naval facilities.

b. Site Description. Building 628 is the Navy's former main electrical substation for the NTC. High voltage electricity was received from the local power company (Conowingo Power). At Bldg 628, Navy transformers stepped down the power to intermediate voltages suitable for distribution to various areas of the base.

When the electricity neared the points of use, the electricity underwent a final step-down by smaller, local transformers to obtain voltages suitable for use within individual buildings. Adjacent to bldg 628 was an open area known as the "switch yard". The primary transformers were located within the switch yard, as were cables and switches which permitted the power to be re-routed in response to equipment failures, maintenance requirements, etc.

Building 693 is the former water treatment plant. Initially, water was taken from an on-base reservoir and processed prior to distribution. As the water needs of the NTC increased, a pumping station was established on the Susquehanna River at the northwest end of Port Deposit. Water was pumped from the river to bldg 693 where it underwent clarification, chlorination, and storage before distribution. Due to the extensive pumping needs, the water plant had high electrical requirements, and was outfitted with appropriate pumps, motors, transformers, capacitors, and associated equipment.

c. Current Use. Neither the electrical substation nor the water plant are in use.

d. Status. In order to prepare the NTC property for transfer to the State of Maryland, an Environmental Baseline Survey (EBS) is being performed. Task I of the EBS ("EBS-I") conducted a review of past operations at the base through a records search, interviews with past employees and environmental regulators, and a physical survey of the 1,200 acre site. The EBS-I study identified various wastes and industrial products which were abandoned during the years of Navy and/or Job Corps operations. The wastes included abandoned containers of swimming pool disinfectant, empty casings from vandalized electrical transformers, paint cans, and empty drums from miscellaneous activities. The Navy awarded a contract to remove these wastes, and that cleanup action took place from March to June, 1997. In the course of conducting the waste cleanup action, PCB contamination, the subject of this action memorandum, was identified at two locations.

Building 628: The Navy's cleanup contractor mobilized to NTC-Bainbridge on Dec 1, 1997 and began sampling that week to delineate the extent of contamination at the electrical substation. Cycles of sampling, excavation, and further sampling continued through December until the holiday break. Cleanup actions resumed on Jan 5, 1998, and reached substantial completion on Jan 16, when actions began to decontaminate and demobilize construction equipment used at the substation. On Jan 27 and 28, 1998, all PCB contaminated materials (seventeen truckloads) from the substation were transported from Bainbridge to the hazardous waste landfill located in Model City, NY.

Building 693: Extensive sampling at the water plant was performed during the same time frame (Dec 1997) as the substation, while cleanup at the water plant was to follow the substation cleanup. On Monday Jan 19, excavation began outside the water plant to locate a sewer line from the basement mechanical room which could possibly act as a pathway for contamination migration from the water plant. During mid- to late-January, several heavy rainfall events caused groundwater elevations to rise; at first, work in the water filled excavation was delayed. By Feb 2, water levels in the basement had risen to approximately three feet, making further work impossible. A decision was made to discontinue work at the water plant until the water recedes to an acceptable level.

Prior to discontinuing work at the water plant, surface soil samples were collected on the grassy area between the mechanical room and the nearby access road, sediment samples were collected where the sewage line formerly terminated in a manhole, and water samples were collected in the excavation where the sewage line had been opened. All of these samples were analyzed for PCBs, and all results were reported as either below detection limits (results from field testing), or non-detect (results from laboratory analysis). Based on these results, it is concluded that the PCBs have not migrated beyond the confines of the water plant.

e. Release Description. At the substation a damaged electrical capacitor was found in the switch yard, and regulatory concerns were expressed about a possible release of Poly-Chlorinated Biphenyls, PCBs (See the attached fact sheet published by the Agency for Toxic Substances and Disease Registry for a further description of PCBs). Several preliminary samples were collected and analyzed to assess the potential for PCB contamination. Eight composite samples were prepared with mixed soils taken near locations where transformers were known to be previously mounted. The results of the PCB composite samples ranged from Below Detection Levels (BDL) to 130 parts per million (ppm). For purposes of comparison, EPA and MDE permit up to 10 parts of PCB in one million parts of soil for sites with unrestricted use, to include permanent residential use; up to 25 ppm of PCBs would be acceptable on sites used as active electrical substations. At the location where the capacitor was found, a sample was collected in the detritus, i.e., from the sand/soil material present between the rocks on the surface of the switch yard. The detritus sample measured 68,000 ppm. Later, the stones at the capacitor location were removed. A sample of the underlying soils was collected and analyzed for both PCBs and dioxin; results for this soil sample were 3.8 ppm of PCBs, and 118.36 parts per trillion (ppt) of dioxin, which is below the level which would require a dioxin cleanup response.

Inside the basement mechanical room of the water plant, capacitors were found in five (5) electrical panel boxes mounted on the walls and on a structural column. Below each of these electrical boxes, a residue of a thick, sticky substance was found on the concrete which was suspected to be a PCB product. Preliminary sampling of the stained locations reported one reading of 210 ppm, and the remaining four samples measured from 580,000 to 880,000 ppm.

3. THREATS TO PUBLIC HEALTH OR THE ENVIRONMENT

a. Threats to Public Health and Welfare. At the switchyard of the substation, initial samples taken from between and beneath the surface stone indicated one location where PCB contamination of soils was at a high level, and several locations with moderate soil contamination that exceeded PCB action levels. In order to affect human health, PCBs must enter the body through skin contact, direct ingestion, or by ingestion of PCB-contaminated fish, shell fish, or marine mammals. At this site, the most likely scenario is that people moving across the site could contaminate their shoes, then later contaminate their hands when removing the shoes. Alternatively, if a person were to disturb the stones with his or her bare hands, direct contact with the contaminated soil could occur.

In the mechanical room of the water plant, the PCB contamination exists as a sticky residue at several locations on the concrete floor, or to a lesser extent, on concrete walls and metal surfaces where the leaking capacitors were located. As above, the most likely exposure scenario is trespassers tracking through contamination on the floor, then making dermal contact with PCB residues which could remain on the persons' shoes. Alternatively, a person could make direct skin contact by placing his hand into the PCB residue. A person might also make dermal contact with lower levels of PCBs by touching dirt or dust particles on the floor, or by touching other surfaces with the room which may have had previous, inadvertent contact with the PCB residue.

b. Threats to the Environment. PCBs typically bond strongly to soil and organic particles, but are very insoluble in water. As such, movement of PCBs from a site is most likely to occur as flowing water moves particles of contaminated sediment; the amount of PCB which would be expected to enter into solution, and leave a site in that way, would be negligible. However, fish or animals might ingest contaminated particles; PCBs can accumulate in the tissue of fish and marine mammals at levels much higher than that found in water. At the electrical substation, the contaminated detritus and soil was lodged between larger stones and the site is essentially flat with no significant drainage pathways; there is little potential for contaminated sediments to reach bodies of water which support marine life.

At the water plant, the known PCB contamination is contained within the basement mechanical room. This area of the basement is prone to periodic flooding due to elevated groundwater levels. As discussed above, the amounts of PCBs which might become dissolved in the water is negligible, and there is no direct pathway for that water to reach the adjacent reservoir, which feeds into the Happy Valley Branch. The potential exists for contaminated sediments to move from the mechanical room via floor drains. However, the observed standing water in the room indicates that the drains are non-functional. Preliminary sampling has not identified PCB contamination outside of the mechanical room which would pose a threat to marine life or the environment. However, further sampling will be performed during the cleanup to verify that the PCB contamination has not migrated into the environment.

4. NO ACTION ALTERNATIVE

Taking no action at these locations would continue the potential exposure of trespassers to PCBs. Although a negative impact to the environment has not been observed, it cannot be assured until the removal action has been completed.

5. PROPOSED ACTIONS AND COSTS

a. Proposed Actions. At the switchyard of the electric substation, it had been proposed to mitigate the potential exposure risk by excavating all PCB contaminated materials and disposing them at an appropriate, approved landfill. Additional sampling was proposed to determine if the surface stone and concrete pads were contaminated, and those would be remediated, as appropriate. It was proposed that field testing would be used to determine the depth and areal extent of contamination. Laboratory testing was proposed to confirm that (1) dioxin contamination is not present at levels of concern, and (2) that soils remaining after excavation do not contain elevated levels of PCBs. **All of the above proposed actions for the building 628 switch yard were completed during Dec 1997 and Jan 1998. Laboratory analysis of confirmation samples indicates that the PCB contamination has been reduced to levels which would permit unrestricted future use of the site.**

At the water plant, it is proposed that accessibility to PCBs be reduced to unrestricted levels of 10 ppm or less. This may be accomplished using any or all of the following actions: (1). Hard surfaces will be washed or wiped using solvents designed for removal of PCBs; (2). Areas that remain contaminated following the solvent wipe may be subjected to high pressure washing; (3). Where contamination is known to exist deeper into the surface, or where appropriate cleanup levels have not been attained using the above methods, the concrete may be removed by sand-blasting or

jack hammering; (4). At locations where contamination has been reduced below hazardous levels (50 ppm) but remains above the action level of 10 ppm, the remaining contamination may be sealed with concrete or other permanent coating which would prevent direct contact with the PCBs. All contaminated wastes generated during this process will be disposed at an appropriate, approved landfill. Additional sampling will be performed to determine if contamination has migrated outside of the building, and if so, will be remediated to acceptable levels. Field testing will be used to determine the depth and areal extent of contamination. Laboratory testing will be used to confirm that all surfaces have been cleaned to acceptable levels.

b. Proposed Project Schedule. As discussed in sections 2.d. and 5.a., above, the PCB removal action at the electric substation switch yard (bldg 628) has been successfully completed.

At the water plant, bldg 693, the proposed PCB removal action was suspended in Jan 1998, shortly after it was initiated. Repeated heavy rains caused the groundwater table to rise, and the basement mechanical room became flooded, making work in the area impracticable. Work will resume at the first reasonable opportunity once water in this area recedes, sometime during the spring or summer of 1998.

c. Estimated Costs. PCB cleanup costs for the substation and water plant are projected to be $263,500. The costs are approximately equal at both locations, and include labor costs, equipment rentals, per diem and travel expenses, laboratory analyses and on-site sampling, off-site disposal of contaminated materials, close-out reports, temporary facilities, site restoration, and contractor's profit.

d. Alternative Actions Considered. Alternative actions considered included soil washing, on-site encapsulation, and taking no action.

With soil washing, contaminated soils would be excavated, cleaned of PCB contamination using specialized solvents and equipment brought to the site, then replaced in the switch yard and re-vegetated. This alternative was discarded for the following reasons: (1) Small volumes of contaminated soils were anticipated in the switch yard; as such, it would not be cost effective to mobilize the specialized equipment for a relatively small job; and (2) The same technology could not be applied to contamination at the water plant. If large quantities of the surface stone at the switch yard were found to be contaminated, especially with high concentrations of PCBs, washing of the stones would have been further evaluated vs. high disposal costs for tons of stone.

With encapsulation, PCB contaminated materials would be encased in concrete, or sealed within an epoxy resin or other suitable

material, and would remain on NTC-Bainbridge. Encapsulation removes the hazard to human health and environment by preventing contact with the PCBs. Encapsulation was discarded as an alternative for the following reasons: (1) The application is not well suited for use on large soil surfaces such as the switch yard; (2) If the contamination exceeds 50 ppm, the encapsulated materials would still be considered hazardous waste, and additional permitting would be required for the long term management of hazardous waste on site. The use of encapsulation has been retained as an option for contaminated concrete surfaces at the water plant that exceed the action level of 10 ppm, but are below the point of designation as hazardous waste, i.e., 50 ppm.

Taking no action was discarded as an alternative because inaction could result in the exposure of human and animal receptors to an undetermined level of risk.

6. RECOMMENDATION

Conditions at this site meet the criteria for a removal action as defined in the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR 300.415(b)(2). As such, this removal action is submitted for approval.

Approvals:

Environmental:
EFA Chesapeake

Frank R. Peters
Manager,
Environmental Restoration Branch

Date: 3/30/98

Commanding Officer:
EFA Chesapeake

Julian Sabbatini
Captain, CEC, USN

Date: 4/2/98

POLYCHLORINATED BIPHENYLS (PCBs)

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls (PCBs). For more information, call the ATSDR Information Center at 1-800-447-1544. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Polychlorinated biphenyls can cause irritation of the nose and throat, and acne and rashes. They have been shown to cause cancer in animal studies. Polychlorinated biphenyls have been found in at least 383 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?
(Pronounced pōl'ē-klôr'ə-nāt ĭd' bī-fē'nôlz')

Polychlorinated biphenyls (PCBs) are a group of manufactured organic chemicals that contain 209 individual chlorinated chemicals (known as congeners). PCBs are either oily liquids or solids and are colorless to light yellow in color. They have no known smell or taste. There are no known natural sources of PCBs. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor.

PCBs don't burn easily and are good insulating material. They have been used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of PCBs stopped in the United States in 1977 because of evidence that they build up in the environment and cause harmful effects. Products containing PCBs are old fluorescent lighting fixtures, electrical appliances containing PCB capacitors, old microscope oil, and hydraulic fluids.

What happens to PCBs when they enter the environment?

- Before 1977, PCBs entered the air, water, and soil during their manufacture and use.
- Today, PCBs can be released into the environment from hazardous waste sites that contain PCBs, illegal or improper dumping of PCB wastes, and leaks from electrical transformers containing PCBs.
- PCBs may be carried long distances in the air; they remain in the air for approximately 10 days.
- In water, a small amount of the PCBs may remain dissolved, but most sticks to organic particles and sediments.
- PCBs in water build up in fish and marine mammals and can reach levels thousands of times higher than the levels in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and old appliances such as television sets and refrigerators; these may leak small amounts of PCBs into the air when they get hot during operation
- Eating food, including fish, meat and dairy products containing PCBs
- Breathing air near hazardous waste sites that contain PCBs
- Drinking PCB-contaminated well water
- Repairing or maintaining PCB transformers

ToxFAQs Internet address via WWW is http://atsdr1.atsdr.cdc.gov:8080/ToxFAQ.html

How can PCBs affect my health?

People exposed to PCBs in the air for a long time have experienced irritation of the nose and lungs, and skin irritations, such as acne and rashes.

It is not known whether PCBs may cause birth defects or reproductive problems in people. Some studies have shown that babies born to women who consumed PCB-contaminated fish had problems with their nervous systems at birth. However, it is not known whether these problems were definitely due to PCBs or other chemicals.

Animals that breathed very high levels of PCBs had liver and kidney damage, while animals that ate food with large amounts of PCBs had mild liver damage. Animals that ate food with smaller amounts of PCBs had liver, stomach, and thyroid gland injuries, and anemia, acne, and problems with their reproductive systems. Skin exposure to PCBs in animals resulted in liver, kidney, and skin damage.

How likely are PCBs to cause cancer?

It is not known whether PCBs causes cancer in people. In a long-term (365 days or longer) study, PCBs caused cancer of the liver in rats that ate certain PCB mixtures.

The **Department of Health and Human Services** (DHHS) has determined that PCBs may reasonably be anticipated to be carcinogens.

Is there a medical test to show whether I've been exposed to PCBs?

There are tests to find out if PCBs are in your blood, body fat, and breast milk. Blood tests are probably the easiest, safest, and best method for detecting recent exposures to large amounts of PCBs.

However, since all people in the industrial countries have some PCBs in their bodies, these tests can only show if you have been exposed to higher-than-background levels of PCBs. However, these measurements cannot determine the exact amount or type of PCBs you have been exposed to or how long you have been exposed. In addition, they cannot predict whether you will experience any harmful health effects.

Has the federal government made recommendations to protect human health?

The **EPA** has set a maximum contaminant level of 0.0005 milligrams PCBs per liter of drinking water (0.0005 mg/L). The **EPA** requires that spills or accidental releases into the environment of 1 pound or more of PCBs be reported to the **EPA**.

The **Food and Drug Administration** (FDA) requires that milk, eggs, other dairy products, poultry fat, fish, shellfish, and infant foods contain not more that 0.2–3 parts of PCBs per million parts (0.2–3 ppm) of food.

Glossary

Carcinogen: A substance with the ability to cause cancer

CAS: Chemical Abstracts Service

Milligram (mg): One thousandth of a gram

PPM: Parts per million

Source of Information

This ToxFAQs information is taken from the 1997 Toxicological Profile for Polychlorinated biphenyls (PCBs) (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-800-447-1544, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://atsdr1.atsdr.cdc.gov:8080/ToxFAQ.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Engineering Evaluation Cost Analysis (EE/CA)

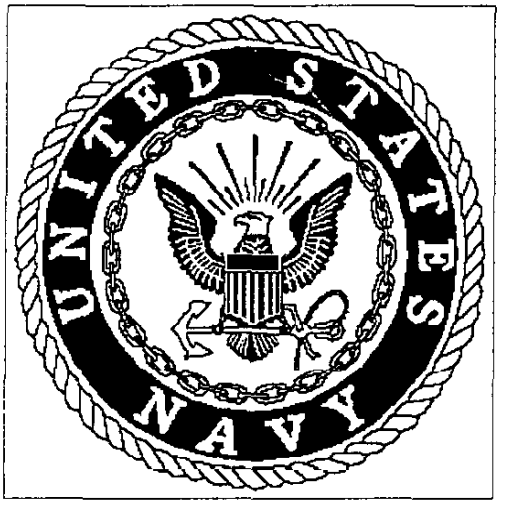
For

Site 1-Old Landfill
Site 2-Fire Training Area

at the

Naval Training Center (NTC)

Bainbridge, Maryland



Engineering Field Activity Chesapeake

Naval Facilities Engineering Command

June 10, 1994

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EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) was prepared by the Engineering Field Activity, Chesapeake (EFA CHES) for Removal Actions at the former Naval Training Center (NTC) Bainbridge, Maryland under authority of the Comprehensive Environmental Response, Elimination and Liability Act (CERCLA). Two sites are included, the Old Landfill (site 1), and the Fire Training Area (site 2). This EE/CA is based upon information contained in The Hydrogeologic Investigation of Waste Disposal Sites (Versar, 1988), and the Draft Remedial Investigation (Ecology and Environment, 1991). Its purpose is to develop a method to reduce or eliminate sources of releases from these two sites. The analysis is limited to the source material. Any releases will be investigated in the concurrently performed Remedial Investigation.

The first site is the Old Landfill, a sanitary landfill that operated from the early 1940s until the base closed in 1976. Besides general municipal type waste, the landfill is known to contain unused pesticides and debris from 40 buildings demolished in the early 1970s. Most recent data indicates chemicals from the landfill have contaminated soil and goundwater that would pose a risk to users. Presently, there is no use of the groundwater that is contaminated.

The recommended alternative for the Old Landfill (Site 1) is to install a Flexible Membrane Liner cap meeting the requirements for municipal landfills. The cap will included a rainwater collection system with a storm water control basin. The cap will prevent direct contact with the landfill, and it will prevent rainwater from leaching landfill pollutants and contaminating groundwater.

The second site is the Fire Training Area. During fire training sessions, oil-soaked structures on top of a concrete pad were set ablaze and extinguished. The water and oil run-off flowed into an unlined, 9-foot-deep oil separator pit, contaminating soil and groundwater. Recent data indicates that there is petroleum contamination in the soil below the pit and stream sediments. A human health risk assessment has determined slightly elevated levels of risk for people that who contact the contaminated stream sediment. Presently, there is no use of the area that is contaminated. However, the area does have potential future use and remediation is necessary.

The objective of the removal action is to prevent direct human contact with the stream sediment and to remove the source of soil contamination. The recommended alternative for the Fire Training Area (Site 2) is on-site landfilling. The objective of this solution is to place the soil under the landfill cap being put on site 1, where it will be immobilized. All soil with petroleum hydrocarbon concentrations over 100 mg/l will be removed. Water from the site will to be treated to remove contaminants and spread on the land.

1.0 FACILITY AND SITE CHARACTERIZATION

1.01 AUTHORITY AND PURPOSE

This EE/CA is being performed under the authority granted the lead agency in the National Contingency Plan 40 CFR 300 Subpart B. The lead agency is given the authority to conduct removal actions in 40 CFR 300.130. This EE/CA is part of a non-time critical removal action as specified in 40 CFR 300.415. The pattern of the report follows the final Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA, EPA publication # PB93-963402 August 1993. State and local participation are in accordance with 40 CFR 300 Subpart F, State involvement in Hazardous Substance Response, and the Maryland Superfund Memorandum of Agreement. An administrative record will be established in accordance with 40 CFR 300 Subpart I.

The purpose of this EE/CA is to establish a concept for addressing the sources of contamination of sites one and two. It is beyond the scope of this action to address contamination released from the two sites. There is insufficient information available to assess their effect on human health and the environment. This contamination will be addressed upon completion of a Remedial Investigation currently being done.

The organization of this report follows the pattern of Introduction, Objectives, Identification, Analysis, and Recommendations. All options assume that the solution will meet all State and Federal requirements, unless noted. All cost information is only assumed to be accurate within 10-15%, due to regulatory changes, uncertainties about the site and assumptions used in the estimating process. Further details on the selected alternatives will be developed during the design of the option and during development of construction contingency plans and drawings.

1.1 SITE (BASE) DESCRIPTION AND BACKGROUND

Topographic Setting

The inactive Bainbridge Naval Training Center (NTC) occupies a 1,200-acre site on the bluffs overlooking the north bank of the Susquehanna River near the town of Port Deposit in Cecil County, Maryland. There is a 100- to 200-foot cliff at the southern edge of the NTC that also constitutes the northern border of the town of Port Deposit (population 700). To the south and southeast, the Bainbridge NTC is bordered by Port Deposit, and State Route 222. The NTC is bordered by rural, residential, and wooded areas to the north and east. State Route 276 forms the western boundary.

History & Background

The NTC operated from 1942 to 1976, with the greatest populations present during World War II and the Korean War. During its primary period of operation, more than 260,000 Navy personnel were trained at the NTC.

The NTC, built in 1942, housed a series of schools for the U.S. Navy that provided training for more than 260,000 men and women between 1942 and 1947. At its peak, in 1945, the base had more than 38,000 people working there.

After the end of World War II, the Navy slowly closed all activities at the base and by 1949, the 1,200-acre base was reduced to caretaker status. However, 2 years later, with the start of the Korean War, the NTC was returned to active status. The base continued to train sailors at a steady pace until 1957. At that point, the Navy, facing a shortage of funds, moved several activities to other area bases and reduced the base population from 14,500 to 4,500.

In 1961, the Navy decided to expand the NTC by establishing the Nuclear Power School and the Naval Reserve Manpower Center on base. Within 10 years, the NTC had grown to be one of the largest training facilities in the country. It employed over 5,500 military and civilian employees with a yearly payroll of $5.8 million in 1971. In 1972, the Navy began scaling back operations, and closed the NTC on June 30, 1976. From 1978 until 1990, a small part of the center was used as a Job Corps training facility.

The base is currently undergoing remediation in preparation for sale. The present remediation includes the removal of asbestos, demolition and landfilling of selected buildings, removal of underground storage tanks, and cleanup of tanks that have leaked.

Climate

On the basis of National Weather Service records of the Benson Site located nearby, the NTC has a continental climate characterized by warm, humid summers, and moderately cold winters. The average annual temperature ranges from 43° Fahrenheit to 65° Fahrenheit with an average daily maximum temperature of 88° Fahrenheit occurring in July. The average daily minimum temperature of 25° Fahrenheit occurs in January. The average annual precipitation rate is 45 inches. Though August generally experiences slightly more rainfall (1-2 inches) than other months, the monthly distribution of precipitation is fairly uniform. Thunderstorms occur on an average of 30 days annually, with local flooding occurring during periods of extended rain. Tornadoes are rare, but tropical storms and hurricanes tend to occur approximately once a year, usually between the months of August and October. The average prevailing wind speed is 9 to 10 miles per hour coming from the northwest and shifting to southerly directions during the summer months.

Geologic Setting

The NTC is located in the Piedmont terrain of eastern Maryland. In the area of the Piedmont, geology generally consists of layered gneisses, granolite, and amphibolites collectively called the James Run formation. Granitic plutons, believed to be the roots of ancient volcanoes, are interspersed in the James Run Formation. The Port Deposit Gneiss, underlying the site, is believed to be the largest of plutons (Higgins 1990). The major structural feature of the eastern Maryland Piedmont is the Baltimore-Washington anti-clinorium. In its northeastern portion within Cecil County and in the vicinity of the NTC, it is characterized on the macro scale by complex thrust faulting and superimposed folding.

Bedrock throughout the Piedmont area is generally heavily jointed and faulted. These joints and fractures result from the compression and easing of rock masses during mountain building episodes. Beneath a 3- to 16-foot-thick sequence of sand and sandy-clay topsoil, is 6 to 41 feet of saprolite (Versar 1988). The saprolite, which usually contains gneissic laminations, was derived from the weathering in-situ of underlying crystalline bedrock. Bedrock within the study area is predominantly the Port Deposit Gneiss, a gray, quartz-rich granite gneiss of Cambrian-Ordovician age (Higgins and Conant 1986). The Port Deposit Gneiss is predominantly composed of felsic minerals (quartz biotite, and feldspar), and consists of both coarsely-crystalline and fine-grained facie. Within the Port Deposit Gneiss, joints average 10 feet in spacing, 1 to 2 inches in width, and generally dip 70 to 75 degrees to the southwest from the horizontal (Versar 1988).

The soils at the oil separator pit area and the landfill area are composed of the Glenelg-Manor-Glenville (GMG) Association which occupies the southern and central portions of the NTC (Versar 1988). These soils are derived from micaceous gneiss bedrock, and are moderately well drained and loamy. Soils on the northern portion of the site are of the Keyport-Beltsville Association and are derived from coastal plain deposits which are gravely to loamy sand and clay (USDA 1973). The soils at the base landfill and the oil separator pit may be divided into specific types. The Made Land series (material which has been graded and mixed (e.g., fill)) and the Manor Loam series compose the soils at the base landfill.

From the landfill itself, where soils slope 15 to 25 percent, to the down gradient Port Deposit Reservoir water tank, where the slope increases to 45 percent, the Manor Loam soils grade intermittently with soils of the Chester and Glenelg series. These two series are also derived from schist and gneiss bedrock, are well drained, and vary in thickness near the landfill area from 15 to 25 feet. A top layer of silt loam normally overlies highly micaceous loam saprolite. The Made Land series also occurs at the oil separator pit. At that location the slope is considerably less steep than at the base landfill. The depth of the series varies between 2 to 4 feet. The Manor Loam series generally consists of 2- to 8-inch layers of brown loam and dark grayish-brown loam surface soil which overlays 8 to 19 inches of friable, brown loam. Following this to a depth of 6 to 10 feet or more, a banded, loamy saprolite occurs. The soil profile is sporadically broken by weathered quartzite fragments and soft, weathered schist (USDA 1973).

Hydrology and Surface Water Contaminant Migration Potential

In southern Cecil County, surface water, in the form of streams, ponds, and lakes is used primarily for agricultural, industrial, and recreational purposes.

The Susquehanna River is used for a variety of purposes by many regional communities. The river is a source of recreation as many people use it for boating and sport fishing. The river is also used in industry for cooling and cleaning purposes. The Town of Port Deposit uses the Susquehanna River as its source of drinking water. The town's water treatment facility has its intake pipe approximately 300 yards out into the river and 200 yards upstream from the west edge of town. Once the water is treated and potable, it is pumped up gradient to the Port Deposit Water Tank located just off State Route 276. The water tank stores up to 500,000 gallons and uses a gravity feed system to supply the town below.

Since the NTC's closure in 1976, surface water has not been used for any specific purposes at the NTC. Several streams flow in a southerly direction from the training center towards the Susquehanna River. These streams are the predominant migration pathways for sources of possible contamination in the surface water system at the NTC.

There are also two old reservoirs on the base that were used for water storage prior to and during base operations. Prior to 1942, Port Deposit used a reservoir located just south of the current water tank location off Route 276. The reservoir was fed by a stream coming off the higher lands now occupied by the base's buildings. The water was then treated with chlorine and gravity fed to the town. After the NTC came into operation and the demand for drinking water skyrocketed, a second reservoir was built on base.[1] This reservoir and a newly constructed water treatment facility supplied the base and the town with drinking water until the base's water-treatment facility closed in May 1985.

There is an unnamed stream that follows State Route 276 and forks to either side of the landfill. The stream channel then carries the drainage south, ultimately into the Susquehanna River. During the wet season and periods of heavy rainfall, the flow for both of the streams may reach 8 to 10 cubic feet per second (cfs) but averages under 5 cfs for the remainder of the year. Happy Valley Branch is the only major stream that flows near the oil separator pit and fire training area. In the past, water from the oil separator pit would be discharged into Happy Valley Branch when oil and water separation had occurred. Stream flow of Happy Valley Branch averages less than 5 cubic feet per second (cfs) during the year and reach up to 25 cfs during periods of heavy rainfall. Happy Valley Branch flows south through private forests and farmland until it empties into the Susquehanna River, approximately 1/2 mile downstream of Port Deposit.

Groundwater and Groundwater Contaminant Migration Potential

Because of the fractural nature of the bedrock the groundwater flow is controlled by secondary permeability. Water occurs to a small degree in the saprolite zone overlying bedrock, but is considered "perched". The existence of perched water is likely governed by seasonal conditions of increased percolation and run-off.

In previous investigations, groundwater was routinely encountered at or near the top of bedrock. However, water levels rose after well installation and development, suggesting that the saprolite functions as a low-permeability, semi-confining layer. As a result, fracture flow is the predominant mode of ground-water occurrence in an area of otherwise impermeable bedrock and saprolitic soils.

Depth to the top of the water table, as determined through previous sampling events, ranges from 13 to 35 feet in the vicinity of the landfill, to 3 to 8 feet in the vicinity of the fire training area and oil separator pit (Versar 1988). Regional groundwater flow is to the south and southeast, along the dip of bedrock and towards the Susquehanna River (Nutter and Otton 1969).

Groundwater is the primary source of drinking water for all residents outside of Port Deposit's town limit and within a 3-mile radius of the NTC. During Versar's Site Inspection (1988) and evaluation using the Hazard Ranking System (HRS), 1,127 homes were identified within the 3-mile radius that use the aquifer of concern as a potable water supply. The vast majority of users are upgradiant of both sites. Groundwater has not been identified as used for agricultural or drinking water purposes downgradiant of either site. The town of Port Deposit is serviced by treated river water taken from upriver. There are no domestic water wells that are presently known to be impacted by either of the sites, based on testing conducted by the Maryland Department of the Environment in Summer 1993.

1.1.1 BACKGROUND AND DESCRIPTION OF OLD LANDFILL

The Old Bainbridge landfill, also known as Site 1, operated from World War II to the mid 1970s. The site is shown in figure 1. Municipal waste is the primary component of the waste, but there are several hazardous constituents.

The landfill was operated seven days a week, by 5 people on rotating 30 day shifts. Two of the landfill operators are still alive on this date, and information has been gathered from Mr. Grover Salyer. The operators stated the landfill had several standard procedures. One was to add clean soil to the bottom of the landfill if there was standing water. The operation was handled with bulldozers, operating with lifts as high as 10-12 feet, depending on soil conditions. The landfill was covered with 7 to 9 inches of soil nightly, if conditions were not muddy. The operators tried to maintain a 2:1 slope whenever possible.

The landfill, from old aerial photographs and interviews, did not extend to the south beyond a 1952 treeline. This allows for the edge of the landfill to be roughly found by looking for trees that are greater than 40 years old. The area at the edge is still suspect because of spillage, but if there is contamination, it will be surficial. Additional testing will be completed before the cap is designed that will further delineate the limits of the landfill.

There are three pits that were dug beyond the 1952 treeline. The pits were not on top of the landfill, but located adjacent to Haul Road, the dirt road that roughly defines the southern border of the landfill. The pits were used as leaching wells for #6 fuel oil, and fuel tank residues. The pits were operated from the mid 60s until the mid 70s. Use of three pits permitted alternating between pits when dumping. There is also a single pit near the western stream (near well #1-GW-2) This site is not heavily contaminated with #6 fuel oil or and residues; additional sampling of this site will be performed before this removal action takes place to determine the need for any special handling.

Pesticides were disposed in the landfill on an erratic basis. In one incident, an estimated 50 (55 gallon) drums were emptied into the center of the landfill. There was apparently no regular, organized disposal of hazardous materials in the landfill. The landfill also contains other non-sanitary wastes such as ash from coal heaters and the burning of domestic waste, paint, and asbestos contaminated buildings.

1.1.2 BACKGROUND AND DESCRIPTION FIRE TRAINING AREA

The Bainbridge firefighter training school is the location of Site 2, or Fire Training Area. The site is shown in figure 2. The primary contaminants are fuel oil and fuel oil residues in the groundwater, though the pesticide DDT and its derivatives have also been detected in soil and sediment.

The Fire Training Area had been operated off and on from 1942 to the mid 1960s. The practical exercises consisted of spraying one of three concrete structures with oil and setting it ablaze. The students would then spray water on the fire. The runoff traveled overland or by a series of drains to an oil separator pit. The petroleum contaminated water would then either drain into the ground or sit until the oil had separated, and then the water would be released.

The oil separator pit is an unlined, man made depression approximately the size of a football field. There is an access road that has been put in the center for drilling a monitoring well. The predominant vegetation is phragmites australis. There is one outfall that comes from the Fire Training area and empties into the pit. The oil separator pit was emptied by a lock that allowed the water to discharge along a 300 foot ditch, to the Happy Valley Branch creek.

The Fire Training area is a concrete apron with three training structures and a school building. Underground storage tanks beneath the apron have been removed and monitoring pipes left in their place. The fire training area is flanked on the south side by the old wastewater treatment plant, and by the Happy Valley Branch creek to the east.

1.1.3 PREVIOUS SITE INVESTIGATIONS

In 1987-1988 an Hydrogeologic Investigation of Waste Disposal Sites was performed by VERSAR under contract to the Navy. This study provided the initial identification of the contaminated sites. From 1990 to 1991, a remedial investigation was performed by Ecology and Environment under contract to the Navy. They issued a draft report on the findings in December 1991. After review by the Navy and the Maryland Department of the Environment (MDE), the Navy has authorized additional sampling and analysis under this contract to complete the Remedial Investigation. Copies of both of these documents are included in the Information Repository.

1.2 PREVIOUS REMOVAL ACTIONS

The Navy has conducted one removal action at the facility, to remove several containers of hazardous and non-hazardous materials left at the facility after operations ended. To non-CERCLA actions have and are taking place. Underground storage tanks have been removed, along with contaminated soil from releases. Presently, buildings are being demolished at the site, with the demolition debris, including asbestos, being disposed of at a new on-site rubble landfill.

1.3 SOURCE, NATURE AND EXTENT OF CONTAMINATION

The contamination at Site 1 is caused by rain filtering through the old landfill and picking up contaminants as groundwater migrates to the river. The contamination is not believed to extend uphill of the landfill. The landfill, by virtue of operating procedures, was generally located above the water table, but, the water table has likely risen because of the mass of the landfill. Contamination detected in monitoring wells downgradient from the landfill near the Navy property boundary have exceeded Maximum Contaminant Levels (MCLs) for drinking water use by less than 100%. The contaminants exceeding MCLs are trichloroethene, vinyl chloride, and chlorobenzene, three solvents generally associated with cleaning and painting operations.

The three pits located down hill (south) from the landfill and the one on the west are another potential source of contamination as rainwater percolates into the soil and pushes hydrocarbons along in the process. Hydrocarbon contamination approaching or exceeding MCLs has not been detected in the groundwater wells which monitor the Navy's property boundary.

The Fire Training Area (FTA) has hydrocarbon contamination arising from runoff associated with training activities and, to a lesser extent, from underground storage tanks which have been removed. Fires burning hydrocarbon fuels were put out, with the runoff allowed to drain to the separator pit. Total petroleum hydrocarbon levels in excess of 1,000 mg/l were found in the soil, with over 100 mg/l in one deep sample taken at a 15 foot depth. No other contaminants where found in the soil in levels above EPA region III's risk based action levels. Pesticide contamination (DDT and its degradation products) exceeding MCLs was detected in surface water and sediments at two locations, above and below the discharge point of the separator pit. Elevated levels of TPH and lead were also found in the outlet of the separator pit.

1.4 ANALYTICAL DATA

All analytical data used for this analysis is included in the Draft Remedial Investigation by Ecology and Environment, Inc.

2.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

2.1 STREAMLINED RISK EVALUATION

A baseline human health risk assessment is included in the draft Remedial Investigation on the Old Landfill and Fire Training Area. There are four pathways evaluated in risk assessments; soil, air, groundwater, and surface water. For the purpose of the final remediation assessment (the remedial investigation), if a threat, cancerous or non-cancerous is found in any pathway, remediation is necessary. For the purpose of this evaluation, a streamlined evaluation is presented. This action is not intended to remove all risk from the site. There is insufficient information available to make a complete risk evaluation. That evaluation will be done once the ongoing remedial investigation is completed.

Under this analysis, risk associated with the source material will be evaluated using available data to determine the need and extent of removal action required. We will also use EPA Region III's risk-Based Concentration Table published in January of 1994. A copy of that report is included in the Information Repository.

In this analysis, future risk scenarios as well as present risk scenarios were evaluated. Risk is evaluated separately for human and ecological receptors. The scenario used for risk assessment is for residential exposure. This assumes an average sized person living on-site, and drinking untreated water for 70 years. For the purposes of the risk assessment, an average child is a 15-Kg (30 Lbs) living on site for 350 days per year, for 6 years, eating 200 mg of dirt and drinking 2 liters of untreated water every day. An average adult is 70 Kg (154 Lbs), lives on site for 350 days per year for 30 years, eating 100 Mg of dirt and drinking 2 liters of untreated water every day. On site is defined as on the actual site (landfill, fire training area). Untreated water is water that comes out of a well that is located at the point of highest contamination, and is not treated for suspended solids, smell or disinfected. These factors are computed and compared with the chemical portion.

The chemical portion of the risk assessment is based on Maximum Contaminant Levels (MCL's) as promulgated in 40 CFR 141 by EPA under the Safe Drinking Water Act. MCL's are concentrations that correspond to the lowest observed adverse effect (defined as 1×10^{-6}). It is assumed that if a pathway exceeds MCL's it constitutes a risk.

Site 1 has impacted the groundwater at levels that exceed MCL's. Because there is contamination of groundwater in excess of MCL's, there is a future risk. The primary chemicals that produce risk are Polynuclear Aromatic Hydrocarbons (PAH), Vinyl Chloride, and 1,4 Dichlorobenzene. Polynuclear Aromatic Hydrocarbons are a group of petroleum based chemicals (Anthracene, Pyrene, Xylene). The total cancer risk is 160×10^{-6}, for adults, and 130×10^{-6} for children, which is above the EPA guideline of

1×10^{-6}. Based on this level of risk, a removal action is recommended to control the source of contaminants. The only non-cancerous chemical of concern is naturally occurring Manganese.

Site 2 exhibits contaminants above risk based limits. The surface water and air at site 2 are affected below risk based limits by the oil-water separator pit. Because of the contamination of the soil, there is a future risk. The chemical of concern is PAH, a byproduct of petroleum. There is DDT and its degradation byproducts present. DDT(total) accounts for 27% of the total risk. The total cancer risk for adults is 7.8×10^{-6} (DDT included) and for children is 22×10^{-6} (DDT included) which are both above the EPA guideline of 1×10^{-6}. Based on this level of risk, a source removal action for petroleum hydrocarbons, lead, and DDT and byproducts is recommended. The only non-cancerous chemical of concern is naturally occurring Manganese.

2.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The NCP and Section 121 of CERCLA require that CERCLA remedial and removal actions attain Federal and state Applicable or Relevant and Appropriate Requirements (ARARs) unless specific waivers are granted. ARAR's must be met in terms of the scope and extent of the remediation and in terms of operations conducted during the response action. Applicable requirements are those which directly apply to the site conditions, for example, the requirement for a Clean Water Act permit for discharges to surface waters during the response action. Relevant and appropriate requirements are those requirements, while not directly applicable may be used because they would be applicable if the site were being closed today, or conditions at the site are so similar to those being regulated that their use seems appropriate. State ARARs must be attained from the state under Section 121(d) of CERCLA, if they are legally enforceable and consistently enforced statewide. In addition to ARARs, other guidance and regulations may be classified as guidance "To Be Considered" (TBC). Additional ARARs and TBCs may be identified later in the removal process if they affect the operation of the removal action.

2.3.1 FEDERAL ARARS

SITE 1 OLD LANDFILL

Safe Drinking Water Act Maximum Contaminant Levels (MCLs) as identified in 40 CFR 141 identify levels of contaminants allowable in drinking water sources. Since the groundwater in the area may in the future be used as a drinking water source, they are applicable standards. MCLs for these sites were previously identified in the streamlined risk assessment. For this action, groundwater will not be treated to attain MCLs, however, sources of contaminants leading to their presence will be addressed.

- The Resource Conservation and Recovery Act (RCRA) Subtitle D Landfill Closure requirements as identified in 40 CFR 258 apply to the closure and post closure care of municipal landfills. These requirements are not applicable since the requirements were not promulgated by EPA until after this landfill was closed, however, they are relevant and appropriate since this landfill was used in a manner similar to those for which the standards were set.

SITE 2 FIRE TRAINING AREA

- The Clean Water Act establishes requirements for point source discharges to surface waters of the United States as identified in EPA's Ambient Water Quality Criteria. These standards are applicable to the discharge from the oil separator pit. In addition, the response action includes draining the pit. These standards will also be applicable the response action since draining the pit is an alternative to be considered as part of the removal action. these requirements add to the need to remove the source of contamination in the pit leading to levels exceeding criteria in the discharge point. They also drive the need to address the DDT and byproduct contamination in the stream at the site.

- The Clean Water Act also establishes requirements for actions in wet lands, requiring a permit from the Corps of Engineers. These requirements may be applicable since the response actions include alternatives that involve removal of water and soil from the separator pit, an identified wet land. As part of this action, the Corps of Engineers will be contacted to identify measures required to protect the wet lands.

- Safe Drinking Water Act Maximum Contaminant Levels (MCLs) as identified in 40 CFR 141 identify levels of contaminants allowable in drinking water sources. Since the groundwater in the area may in the future be used as a drinking water source, they are applicable standards. MCLs for these sites were previously identified in the streamlined risk assessment. For this action, groundwater will not be treated to attain MCLs, however, sources of contaminants leading to their presence will be addressed.

- RCRA identifies requirements pertaining to the handling and disposal of hazardous wastes, as identified in 40 CFR 261. While data collected to this date indicates that material that may be removed from site 2 does not meet this criteria for designation as hazardous, this will be confirmed by testing during the removal action. If the soil and/or water meets or exceeds criteria making it hazardous waste, it will be disposed of accordingly.

2.3.2 State ARARs

The MDE has identified its ARARs through their letter of 18 March 1994. A copy of this letter is included in the Information Repository. Below is a recap of the ARARs the MDE identified. The ARARs identified were not site-specific.

- COMAR 26.04.07.21 A, B, D, and E and .22A, B and C provide minimum specifications for the closure and post closure of municipal type landfills. These requirements are relevant and appropriate since the landfill, site 1, was used as for municipal type wastes. These requirements will be used for developing response alternatives for site 1.

- Environmental Article Title 9 Subtitle 2,4 provides for the protection of the drinking water of the state. This law is applicable since the ground water may in the future be used as a drinking water source. This law will be further addressed in the final remedial action for both sites, however, for this removal action, removal or control of the source of contamination will be addressed.

- COMAR 26.08.02.03 and .03.01 set standards for discharges to waters of the state and promulgate the state's anti-degradation policy. This regulation is applicable to any discharges of treated water during the removal action.

- COMAR 08.05.04 serves to protect non-tidal wetlands. This is relevant and appropriate to the action at site 2 since the action may involve removing soil from the separator pit, a wetland. This requirement will be addressed through the wetland Corps of Engineer's process.

- COMAR 26.09.01.01 and .07B and .08A addresses erosion and runoff during land disturbance. This requirement is applicable to construction actions at both sites. the navy will contact the MDE after the project design specifications are completed to identify requirements under this regulation.

- COMAR 26.11.03.06, .06.02, .06.03, .06.06, .06.08, .06.09, .15 and .19.02G provide air quality standards, general emission standards and restrictions for air emission from vents and treatment devices. These standards are applicable to the design of the landfill cap option for site 1.

- COMAR 26.02.03.02A(2), B(2) and .03A identify limits on noise levels not to be exceeded at the site boundary. These requirements are applicable and will be addressed in the work plan of the removal action contractor.

- COMAR 26.04.04 provide well construction specifications. These requirements are applicable to monitoring wells constructed as part of the investigation of both sites.

- COMAR 26.05 provides requirements for standards and licensing of persons installing and drilling wells. These standards are applicable to drillers of monitoring wells required as part of the investigation of both sites.

- COMAR 26.13.01, .02, .03 and .04 provide requirements for the handling and disposal of hazardous wastes. While data collected to this date indicates that material that may be removed from site 2 does not meet this criteria for designation as hazardous, this will be confirmed by testing during the removal action. If the soil and/or water meets or exceeds criteria making it hazardous waste, it will be disposed of accordingly.

- COMAR 08.05.02 provides for water appropriation permits for use of water of the state. This requirement will be applicable for use of groundwater of the state if it is part of the selected response alternative.

2.3.3 *TO BE CONSIDERED (TBC)*

- EPA Region III publishes quarterly Risk-Based Concentration Table that can be used to determine the risk associated with contaminants. The table published 7 January 1994 was used in this evaluation to assess the risk posed be the site. These values will also be used with alternatives at site 2 to determine the scope of soil and sediment to be remediated.

- Through informal conversation, the MDE has indicated that a typical action level for remediation of soils contaminated with petroleum hydrocarbons is 100 mg/l. Since this level is not promulgated into regulation, it can not be used as an ARAR under CERCLA, however, it is an important consideration in determining the extent of soil to be addressed at both sites 1 and 2. As such, we will use this standard in addressing the alternative of removal of soil contaminated with petroleum hydrocarbons.

2.3 IDENTIFICATION OF REMOVAL ACTION SCOPE

The scope of this removal action is to address the source of contamination at the two sites on NTC Bainbridge. Addressing the source of contamination should lower the levels of contamination and will help to bring both sites into compliance with ARARs. Since the extent of groundwater contamination is not known, that contamination will be addressed in the Remedial Investigation.

At Site 1 the source of contamination is contaminated material in an unlined landfill. This EE/CA will analyze several types of remediation to select the type that is protective of human health and the environment, durable, and cost effective.

At Site 2 the source of contamination is the oil separator pit and contaminated sediments. Since the pits adjacent to the landfill are presumed to be petroleum contaminated, they will be included in whatever treatment is recommended for the soils at the Fire Training Area. This report will analyze available technologies to address the source of the contamination at Site 2. Removing the source of contamination at Site 2 will immediately lower the contamination in the surrounding environment, and may bring the site into compliance with ARARs.

2.3.1 ESTIMATED EXTENT OF CONTAMINATION

At Site 1, the contamination comes from a municipal landfill that is approximately 15 acres in surface area, and 50-60 feet deep. There are also three #6 fuel oil pits that are approximately 50 feet across, and 2-5 feet deep.

At Site 2, the contamination comes from an unlined oil separator pit that is approximately 48,000 sq. feet, with contamination extending 15 feet down.

2.3.2 CHEMICAL SPECIFIC GOALS

The goals for this removal action will focus on risk based cleanup requirements, and ARARs. Specifically, the removal action will seek reduce the concentration of contaminants of concern to below background risk as identified in EPA Region III Risk Table or ARARs. Background risk as defined by the EPA is 1×10^{-6}. The chemicals of concern and the federal risk based cleanup goals are:

Site 1	Groundwater(mg/L)	Regulatory source
Vinyl Chloride	0.0015	(cancer risk)
1,4 Dichlorobenzene	0.6	MCL
Trichloroethylene	0.005	MCL
Anthracene(PAH)	0.0002	MCL
Xylene(total)	10	MCL
Pyrene(PAH)	0.0002	(cancer risk)

Site 2 & Fuel pits	Groundwater(mg/L)	Regulatory source
Benzo(a)anthracene	0.0001	MCL
Benzo(a)pyrene	0.0002	MCL
Benzo(k)flouranthene	0.0002	MCL
Dibenzo(a, h)anthracene	0.0003	MCL
Indeno(1, 2, 3-cd)pyrene	0.0004	MCL
Total Petroleum Hydrocarbons (TPH)	100 mg/l (soil)	MDE typical value

2.4 DETERMINATION OF REMOVAL ACTION SCHEDULE

The schedule for these actions will be determined once the response contractor is identified. It is the intention of the Navy to complete this action by the end of December 1994, with construction activity occurring during the fall of 1994.

2.5 PLANNED REMEDIAL ACTIVITIES

In addition to this removal action, the Navy will complete several other actions in the CERCLA process. A parallel step will be to gather additional information to complete the Remedial Investigation. After the Remedial Investigation is complete, a Feasibility Study will be done to evaluate if additional remedial measures must be taken. Once the Feasibility Study is done, any remedial action recommended will be completed. The current schedule calls for the Feasibility Study to be completed in the early spring of 1995

3.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

3.1 SITE 1 OLD LANDFILL

All cost estimates are based on a 15 acre landfill, 60 feet deep. The west side of the landfill will require slope stabilization across a 3500 foot expanse, and those costs are included. Final requirements will be identified during removal action design. These assumptions are only for the purpose of evaluating and comparing alternatives. All long term costs are compared on a yearly basis, with the assumption that maintenance will extend for 50 years, with no inflation and no changes in regulatory requirements. For the present value analysis, the discount factor is 4.5%, and 1995 standard dollars are used. As work progresses, new information may modify costs. **The numbers are given in thousands,** using Means Site Work & Landscape Cost Data 1992, and Means Building Construction Cost Data 1992, Baltimore, Maryland city cost index. This section will only present the solutions that have passed the first two criteria of the EE/CA guidance, Protectiveness and Ability to Achieve Removal Objectives

3.1.1 NO FURTHER ACTION

As required by the National Contingency Plan (NCP) the no further action option will be considered for this site. The no further action option means that no remedial action would be implemented to remove/control the contamination. Sampling would continue at selected wells to monitor the concentration of contaminants and if action is necessary, or no further health risks are present. This option is not protective of human health and the environment and would not achieve removal action objectives, but will be included for baseline assumptions.

Item	Initial Cost	Yearly Cost
Sampling (7 sites x 4 times per year)		56
Total	0	112

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	0	56,000	1,106,560
Present Value			1,100,000

3.1.2 CONTAINMENT TECHNOLOGIES

Containment technologies are those technologies that contain the source of contamination and thereby reduce the amounts of contamination in the environment. Containment technologies usually include the placement of some kind of cover over the contamination to prevent rainwater from infiltrating. Containment will require continued groundwater monitoring to detect if the cover has been breached. All caps would prevent the infiltration of rain through the landfill to the groundwater, cutting off one major source of groundwater that can migrate through the landfill. Additionally, all caps will require a 24" covering of topsoil, and yearly maintenance on the vegetation cover to remove vegetation, and maintain grass covering. All caps considered are protective of human health and the environment, and should achieve removal action objectives 3-5 years after construction is complete. The Standard costs for a cap are:

Item	Initial Cost	Yearly Cost
Mobilization/Demobilization	50	
Site Clearing(disposed by burning)	103	12
Erosion Control (West Side)	2,110	25
Protective Soil Layer (24", from on base)	380	
Sampling (7 sites x 4 times per year)	0	56
Monitoring During Work(Air and Soil Sampling)	300	
Decontaminating Vehicles	100	
Gas Vent Layer	238	
Fence around Landfill(8500 feet)	145	2
Total(Standard Cap costs)	3,426	375

3.1.2.1 CLAY CAP

An all clay cap is a liner of soil that ensures hydraulic conductivity of less than 1 x 10^{-7} cm/sec. The most common way to meet this requirement is to use high clay content soil, hence the name. The cap consists of one layer of clay soil that is at least 12" thick, applied in 6" lifts with compaction between lifts. The advantages of this type of liner is that permeability is a function of thickness, and there is a local source of clay. The disadvantage is the length of time to construct (averaging 6 months).

Item	Initial Cost	Yearly Cost
Buying Drainage Layer (6" deep sand/rock, 10 miles to source)	114	
Buying Clay for Layer (12" deep, 10 miles to source)	175	
Spreading and Compacting	168	
Standard Cap costs	3,426	955
Total	3,883	95

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	3,883,000	95,000	1,877,200
Present Value			5,760,000

3.1.2.2 FLEXIBLE MEMBRANE LINER CAP

A Flexible Membrane Liner cap consists of a thick plastic that is placed on the landfill. The plastic must be placed on a smooth surface (usually 3" of clay), be at least 20 mils thick, and be wholly below the frost zone. The permeability of the cap is determined by breaks in the liner. The advantages are length of time to construct (3-4 months), and minimal regarding of the landfill. The disadvantage is the possibility of penetrations (especially as the cap gets older).

Item	Initial Cost	Yearly Cost
Buying Clay for Layer (3" deep, 10 miles to source)	30	
Spreading and Compacting Clay	20	
Buying Geogrid	125	
Buying Flexible Membrane Liner	80	
Spreading and Sealing Liner	50	
Standard Cap costs	3,426	05
Total	3,731	95

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	3,731,000	95,000	1,877,200
Present Value			5,608,000

3.1.2.3 DISPERSION BY CHEMICAL REACTION CAP

A dispersion by Chemical Reaction cap is soil that has had a chemical added so that it forms into Calcium Carbonate(impermeable rock) on contact with water. This type of cap would have to be at least 3 feet thick, but would use native soil. The advantages are that the cap is "self healing", and uses native soils, and will not change the height of the landfill. The disadvantages are that the technology is new, and would require that significant quantities of topsoil from elsewhere on base be transported to the site to avoid disturbance of the landfilled materials. The construction time is about 4-5 months.

Item	Initial Cost	Yearly Cost
Treat Soil	1,500	
Move, Stockpile soil	100	
Spreading and Compacting	100	
Standard Cap Costs	3,426	955
Total	5,126	95

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	5,126,000	95,000	1,877,200
Present Value			7,003,000

3.1.2.4 SURFACE WATER DIVERSION

Surface water diversion is the simultaneous diversion of overland water flow from the landfill with the covering of the landfill, and channeling of rainfall off the surface of the landfill. This technique would be the covering of the landfill with asphalt or other non-permeable surface, and channeling local water around the landfill. The asphalt surface would also require channeling of rainwater off-site so that it does not become contaminated. The advantages are low initial cost, and use of the land as a parking lot, or other low weight surface. The disadvantages are that the surface must be very well maintained. While all line items of a standard cap do not apply, the costs are similar because of the cost of drainage systems, detention ponds, etc. The construction time would be about 5 months.

Item	Initial Cost	Yearly Cost
Pave Surface	335	20
Runoff Control	400	20
Edge Erosion Control	350	
Standard Cap Costs	3,426	95
Total	4,511	135

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	4,511,000	135,000	2,670,000
Present Value			7,181,000

3.1.2.5 SLURRY WALL

A slurry wall is an adjunct to other remediation technologies. A slurry wall is a vertical wall in the ground that forces groundwater to flow around the landfill. The application is that if the landfill is located below the water table, this treatment will prevent underflow. This treatment is to address the groundwater that is flowing under and possibly through the landfill. This treatment does not address direct infiltration of the landfill and will require additional treatments. Because of the confining streams, and the relatively high water table, the practical dimensions of a slurry wall would be 300' x 50' deep. This solution does not meet the evaluating criteria, but will be included for baseline comparison.

Item	Initial Cost	Yearly Cost
Excavate	500	
Install Drainage	50	15
Backfill	80	
Outfall testing	50	3
Total	680	18

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	680,000	18,000	355,500
Present Value			1,030,000

3.1.3 LEACHATE COLLECTION (PUMP AND TREAT)

A Leachate Collections system is a set of groundwater wells, piping, and a treatment system for water. The wells are placed at the edge of a contaminant and used to extract contaminated groundwater. The water is then piped to a treatment system. The treatment system then treats the water to levels acceptable for discharge. In this case, because of the contaminahts, the water must be cleaned to non-detect for the chemicals of concern (REF. 40 CFR 403) This type of system does not address the source of contamination. The most efficient form found utilizes horizontal drilling to form a collection system under the landfill. The advantages are the low initial cost, and minimal disturbance of the landfill. The disadvantages are the volume of waste generated, and the operation and maintenance cost. This solution does not meet state proposed ARARs, but is included for completeness.

Item	Initial Cost	Yearly Cost
Horizontal Drilling/ Installing Wells (3, 1200 ft wells)	900	5
Erosion Control (West Side)	1,500	25
Sampling (7 Sites x 4 times per year)	0	56
Monitoring during work	300	
Fence around Landfill (8500 feet)	145	2
Treatment piping/reactors/discharge system	720	10
Treatment of wastewater	0	200
Total	3,565	298

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	3,565,000	298,000	5,890,000
Present Value			9,450,000

3.1.4 EXCAVATION AND REMOVAL

This type of removal action is intended for small areas of contamination where it is feasible to remove all contaminated material and transport it to an approved landfill for disposal or incineration. The remediation would include taking heavy construction equipment to load the contents of the landfill into containers that would then be transported to an appropriate landfill or incinerator for final disposal. The advantages are that the site is clean, but the disadvantages are the hazardous waste on the highway risks, and the cost.

Item	Initial Cost	Yearly Cost
Excavation	2,100	
Sampling during work	300	
Decontaminating vehicles	100	
Backfill/regrade site	1,000	
Transportation (100 miles)	48,700	
Disposal	93,000	
Total	145,200	0

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	145,000,000	0	0
Present Value			145,000,000

3.2 SITE 2 FIRE TRAINING AREA

3.2.1 NO FURTHER ACTION

As required by the NCP the no further action option will be considered for this site. The no further action option means that no remedial action would be implemented to remove/control the contamination. Sampling would continue at selected wells to monitor the concentration of contaminants and determine if action is necessary, or no further health risks are present. This solution is not protective of human health and the environment, but is included for baseline comparison.

Item	Initial Cost	Yearly Cost
Sampling (4 sites x 4 times per year)		30
Total	0	6030

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	0	30,000	600,000
Present Value			600,000

3.2.2 LANDFILLING

This type of removal action is designed for small spills that are easily removable. There are two types discussed below. Both processes involve taking heavy earth moving equipment and loading the contamination on a vehicle that will transport it to a disposal facility for incineration or landfilling. In this case, there are two alternatives for disposal, on-site and off-site.

3.2.2.1 ON-SITE

On-site disposal would be using it for fill for the on base landfill. Because oil is not listed as a hazardous substance, placing the soil in the landfill would not trigger Subtitle C requirements for a cap design. The advantages of this solution would be cost. The disadvantages would be that the source of the water contamination would only be contained, not treated, and it would add to the volume of the landfill.

Item	Initial Cost	Yearly Cost
Excavation	75	
Sampling	75	
Transportation (1/2 mile)	64	
Regrading and backfilling	100	
Total	314	0

Project Years	Capital Cost	Annual Cost	Discounted Cost
1	314,000	0	0
Present Value			314,000

3.2.2.2 OFF-SITE

Off-site disposal would be loading the soil onto vehicles for transportation to a recycling facility, incinerator, or landfill. The soil can go to a subtitle D landfill, because of the non-hazardous nature. The advantages are that the soil would be removed from Navy property, the disadvantage is the cost and risk involved with transporting on the open highway.

Item	Initial Cost	Yearly Cost
Site Preparation & reseeding	12	
Excavation	75	
Sampling	75	
Transportation (10 miles)	225	
Disposal($30 tipping fee)	900	
Total	1,275	0

Project Years	Capital Cost	Annual Cost	Discounted Cost
1	1,275,000	0	0
Present Value			1,275,000

3.2.3 THERMAL TREATMENT

Thermal treatment would involve placing a thermal treatment unit on site. There are two types of thermal treatment analyzed below. The soil would be fed to the kiln which would raise the temperature. The petroleum compounds would then volatilize off the soil or be destroyed, leaving clean fill. The advantage of this process is that the contamination is addressed relatively quickly. The disadvantage is the cost.

3.2.3.1 INCINERATION

Incineration would involve raising the temperature of the soil to 2,000 to 3,000 degrees. The petroleum would be destroyed in the process. The process of raising the soil temperature that high is very difficult, and energy intensive. Costs are relatively high, but the advantage is permanent destruction of the contaminants. The most cost effective means would be to transport the contaminated material off-site to a permanent incinerator.

Item	Initial Cost	Yearly Cost
Site Preparation & Reseeding	12	
Excavation	75	
Sampling	75	
Transportation	225	
Incineration	9,000	
Spread Fill	75	
Total	9,462	0

Project Years	Capital Cost	Annual Cost	Discounted Cost
1	9,462,000	0	0
Present Value			9,462,000

3.2.3.2 LOW-TEMPERATURE THERMAL DESORPTION

Low-temperature desorption raises the temperature to 500-600 degrees. The petroleum is only evaporated off the soil and would be burned in the exhaust, or filtered out with exhaust controls. The emissions would be approximately about the same as a diesel truck.

Item	Initial Cost	Yearly Cost
Site Preparation & Reseeding	12	
Sampling	75	
Excavation	75	
Low Temperature Desorption	600	
Spread Fill	75	
Total	837	0

Project Years	Capital Cost	Annual Cost	Discounted Cost
1	837,000	0	0
Present Value			837,000

3.2.4 BIODEGRADATION

Biodegradation would involve excavating the soil, placing it on a flat surface, and allowing natural microorganisms to break down the petroleum compounds. The process would take from 6 months to two years, depending on soil and weather conditions. The advantage is the cost and the destruction of the contamination. The disadvantage is the time involved.

Item	Initial Cost	Yearly Cost
Site Preparation & Reseeding	12	
Sampling	100	
Excavation	75	
Spread Fill	75	
Total	262	0

Project Years	Capital Cost	Annual Cost	Discounted Cost
1	262,000	0	0
Present Value			262,000

3.2.5 STABILIZATION

Stabilization of the contamination is the process of rendering the chemicals immobile. This can be accomplished several ways. The most common and feasible are listed below.

3.2.5.1 CAPPING

Capping would involve the placement of a non-permeable cover over the contaminated area. This would prevent infiltration, and decrease the amount of contaminants in the surface water. The disadvantages are that the source of the contamination is not removed, expense and possible ineffectiveness due to a high water table and under flow. This option is best suited to sites that are much larger than the Fire Training Area.

Item	Initial Cost	Yearly Cost
Site Clearing(disposed by burning)	30	5
Buying and Placing Clay & Drainage Layer	800	
Protective Soil Layer (24", from on base)	50	
Sampling (4 sites x 4 times per year)	0	30
Monitoring During Work(Air and Soil Sampling)	200	
Decontaminating Vehicles	25	
Worker Training/meetings	10	
Fence around capped area(1500 feet)	15	2
Total	1,130	37

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	1,130,000	37,000	730,000
Present Value			1,860,000

3.2.5.2 DISPERSION BY CHEMICAL REACTION

Dispersion by Chemical Reaction is the process of adding a proprietary chemical to the soil to bind up the contaminants. This would prevent the leaching of the contaminants, thereby improving water quality. The site would still require excavation for treatment, but the original soil would be replaced. The cost for this option assumes that the cap on the landfill is constructed with the same material.

Item	Initial Cost	Yearly Cost
Site Preparation & Reseeding	12	
Excavation	75	
Sampling	100	
Dispersion By Chemical reaction Process	150	
Spread Fill	75	
Total	412	0

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-50	*412,000*	*0*	*0*
Present Value			412,000

3.2.6 GROUNDWATER COLLECTION AND TREATMENT

Ground water collection would involve the installation of water wells, and a treatment system. The groundwater would be pulled from the wells, piped to the treatment unit, and treated to non-detect before being discharged. Two methods are discussed below. The advantage of this option is that the ground would be left virtually undisturbed. The disadvantages are that the treatment would take from five to ten years, and would not address contaminated sediment in streams that would require additional cleanup.

Item	Initial Cost	Yearly Cost
Installation of Wells(3)	18	
Sampling	15	10
Piping systems	10	
Pumps	5	3
Total(Standard Groundwater Costs)	48	13

3.2.6.1 ACTIVATED CARBON TREATMENT

Activated Carbon treatment would involve running the water through a reactor bed, and having the carbon filter out the contaminants. The carbon would have to be replaced periodically, and disposed in an appropriate landfill. The filter would require no other maintenance, and would have very few working parts.

Item	Initial Cost	Yearly Cost
Activated Carbon(with disposal)	20	10
Reactor Vessel	25	
Standard Groundwater costs	48	13
Total	93	23

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-20	93,000	23,000	300,000
Present Value			393,000

3.2.6.2 AIR STRIPPING

In this process, contaminated water is pumped to the top of an air stripping tower, then permitted to fall over packing material that creates drops of water. A large volume of air is blown through the falling water, and volatile contaminants are stripped from the water to the air in the process. The disadvantages of this process is that it releases the contaminants to the air, and has both the water pump, and the air blower to maintain.

Item	Initial Cost	Yearly Cost
Air Stripping Tower	10	
Air Blower	2	2
Standard Groundwater costs	48	13
Total	60	15

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-20	60,000	15,000	195,000
Present Value			255,000

3.2.7 SOIL WASHING

There are two types of soil washing considered in this EE/CA. Soil washing is the process of adding surfactants to the soil to dissolve contaminants. The mixture is then collected and treated or disposed. There are two modes of operation, in-situ, and ex situ. The advantages are that the addition of surfactants decreases the time for cleanup. The disadvantages are the additional cost of the surfactants.

3.2.7.1 IN SITU

In- Situ Soil Washing requires the installation of water wells and a dispersion system. The contaminated soils remain in place (in situ). The surfactant solution is then sprayed on the soil, allowed to percolate down, and collected by the wells. The process takes two to four years. The advantages are that the sight is left mostly undisturbed. The disadvantages are the time for remediation and the expense.

Item	Initial Cost	Yearly Cost
Surfactants (including disposal)	4	10
Sampling	50	15
Overspray system	4	
Standard Groundwater costs	41	3
Total	99	28

Project Years	Capital Cost	Annual Cost	Discounted Cost
1-3	99,000	28,000	77,000
Present Value			176,000

3.2.7.2 EX SITU

Ex-Situ soil washing involves the excavation of the soil, putting the soil in a reactor, and allowing the contaminants to dissolve. The soil then can be replaced as clean fill.

Item	Initial Cost	Yearly Cost
Surfactants (including disposal)	15	
Site preparation	12	
Sampling	75	
Excavation	75	
Re spreading and compacting	75	
Reactor Vessel(including operation)	25	
Total	277	

Project Years	Capital Cost	Annual Cost	Discounted Cost
1	277,000	0	0
Present Value			277,000

4.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

4.1 INTRODUCTION

In this chapter removal action alternatives discussed in the preceding chapter will be analyzed. In the Final GUIDANCE ON CONDUCTING NON-TIME-CRITICAL REMOVAL ACTIONS UNDER CERCLA the U.S. EPA uses eight factors in the selection of a remedy.

The first two, protectiveness and ability to achieve removal action objectives, are qualifying criteria. The first two factors are positive/negative qualifiers, either a solution can meet the removal objectives or it cannot. If a solution cannot meet the two qualifying criteria then it is eliminated. However, the No Further Action, and Slurry Wall solutions have been kept for comparison as required in the NCP, even though they do not satisfy the first two criteria.

The next four are comparative factors. The factors are Technical Feasibility, Availability, Cost, and Administrative Feasibility. Each remedy will be rank ordered from one to nine for site one, and one to twelve for site two. The individual scores will be added, with the lowest score being the recommended alternative.

Two other factors will be weighed and may affect the final selection, those are state acceptance, and community acceptance. These concerns will be addressed in the removal action memorandum.

4.1.1 TECHNICAL FEASIBILITY

Technical Feasibility is how difficult the solution would be to implement and maintain. This criteria includes such factors as the demonstrated useful life, construction and operational considerations, adaptability to environmental conditions, and whether the initial construction can be completed in one year. An easily accomplished, or more protective solution will be rated higher than one that is less expensive in this rating category.

No.	Site 1 Old Landfill	Site 2 Fire Training Area
1	No Further Action	No Further Action
2	Slurry Wall	On-Site Landfilling
3	Surface Water Diversion	Biodegradation
4	Leachate Collection	Capping
5	FML Cap	Thermal Desorption
6	Clay Cap	DCR Soil Treatment
7	DCR Cap	Ex-Situ Soil Washing
8	Excavation and Disposal	Off-Site Landfilling
9		Incineration
10		In-Situ Soil Washing
11		Activated Carbon Grndwtr Trtmnt
12		Air Stripping Grndwtr Trtmnt

4.1.2 AVAILABILITY

Availability is a measure of how accessible or resource intensive a solution is. Availability considers how much equipment, personnel, lab testing, off-site treatment and disposal capacity, and recurring support a solution uses. A solution that uses fewer, or less expensive resources will be rated higher than a resource intensive approach. Time is only a factor in that it increases costs.

No.	Site 1 Old Landfill	Site 2 Fire Training Area
1	No Further Action	No Further Action
2	Slurry Wall	On-Site Landfilling
3	Clay Cap	Biodegradation
4	FML Cap	DCR Soil Treatment
5	DCR Cap	Incineration
6	Leachate Collection	Off-Site Landfilling
7	Surface Water Diversion	Thermal Desorption
8	Excavation and Disposal	Ex-Situ Soil Washing
9		Capping
10		In-Situ Soil Washing
11		Activated Carbon Grndwtr Trtmnt
12		Air Stripping Grndwtr Trtmnt

4.1.3 ADMINISTRATIVE FEASIBILITY

Administrative Feasibility considers what permits are required, impacts on adjoining property, right of ways that may be required, and the ability to control the solution. A solution that is non-intrusive will rate better than one that is more protective of the environment.

No.	Site 1 Old Landfill	Site 2 Fire Training Area
1	Slurry Wall	On-Site Landfilling
2	FML Cap	Biodegradation
3	Clay Cap	DCR Soil Treatment
4	DCR Cap	Activated Carbon Grndwtr Trtmnt
5	Surface Water Diversion	In-Situ Soil Washing
6	Leachate Collection	Thermal Desorption
7	No Further Action	Ex-Situ Soil Washing
8	Excavation and Disposal	Air Stripping Grndwtr Trtmnt
9		Off-Site Landfilling
10		No Further Action
11		Incineration
12		Capping

4.1.4 COST

Cost is the breakdown of results from the previous section. Yearly costs are calculated for 50 years, or the average time to finish remediation. Cost is a comparison of cost incurred, not availability, administrative feasibility, or technical feasibility.

No.	Site 1 Old Landfill	Cost	Site 2 Fire Training Area	Cost
1	Slurry Wall	1,030	In-Situ Soil Washing	176
2	No Further Action	1,100	Air Stripping Grndwtr Trtmnt	255
3	FML Cap	5,608	Biodegradation	262
4	Clay Cap	5,760	Ex-Situ Soil Washing	277
5	DCR Cap	7,003	On-Site Landfilling	314
6	Surface Water Diversion	7,181	Activated Carbon Grndwtr Trtmnt	393
7	Leachate Collection	9,450	DCR Soil Treatment	412
8	Excavation and Disposal	145,000	No Further Action	600
9			Thermal Desorption	837
10			Off-Site Landfilling	1,275
11			Capping	1,860
12			Incineration	9,462

4.2 SUMMARY OF SCREENING OF REMOVAL ACTION TECHNOLOGIES

4.2.1 SITE 1 OLD LANDFILL

Solution Option	Tech. Feas.	Avail.	Cost	Admin Feas	Total
No Further Action	1	1	2	7	11
Surface Water Diversion	3	7	4	5	19
FML Cap	**5**	**4**	**3**	**2**	**14**
Clay Cap	6	3	5	3	17
DCR Cap	7	5	6	4	22
Leachate Collection	4	6	7	6	23
Excavation and Disposal	8	8	8	8	32
Slurry Wall	2	2	1	1	6

Note: Slurry Wall and No further action are discarded because they do not meet minimum ranking requirements, and are only included for comparison.

4.2.2 SITE 2 FIRE TRAINING AREA

Solution Option	Tech. Feas.	Avail.	Cost	Admin Feas	Total
Air Stripping Grndwtr Trtmnt	12	12	2	8	34
In-Situ Soil Washing	10	10	1	5	26
On-Site Landfilling	**2**	**2**	**5**	**1**	**10**
Activated Carbon Grndwtr Trtmnt	11	11	6	4	32
Biodegradation	3	3	3	2	11
Ex-Situ Soil Washing	7	8	4	7	26
DCR Soil Treatment	6	4	7	3	20
Thermal Desorption	5	7	9	6	35
Off-Site Landfilling	8	6	10	9	33
No Further Action	1	1	8	10	20
Incineration	9	5	12	11	37
Capping	4	9	11	12	46

Note: No further action is discarded because it does not meet minimum ranking requirements, and is only included for comparison.

5.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

5.1 Site 1 Old Landfill

The recommended option for the old landfill is a Flexible Membrane Liner cap. Conceptually, this solution will include clearing the site, leveling as much as possible, installing a High Density Polyethylene cap, drainage layer, and vegetative layer. Leveling the site will include erosion control. The FML layer will be applied in sheets and then the sheets will be sealed. The vegetative layer will include 24" of soil, and reseeding with native local vegetation which can sustain itself through seasonal extremes with little attention. The drainage layer will be constructed of sand and be at least 6" in depth.

This particular solution was recommended because of the ability to protect the environment, maintainability, usability, and low comparative cost. Disadvantages of this solution are that the solution may not be immediate or final, depending on continuing groundwater sampling results. However, this solution is a good initial response that will prevent direct contact with the landfill contents, and reduce the amount of leachate.

5.2 Site 2 Fire Training Area

The recommended solution for site 2 is on-site landfilling. Conceptually the solution will include clearing the site, excavating the soil, loading it on dump trucks and using it for fill material in the landfill. Because petroleum is not a listed hazardous waste, the addition will not cause extra requirements for the cap. The material can therefore be excavated using normal equipment, sampled for site close out, and backfilled with fill from on base.

This particular solution was recommended because it is protective of the environment, cost effective, and feasible. The only disadvantage is that the petroleum will not be destroyed. But the soil will be put to a use, in a way that is cost effective and protective of human health and the environment.

If, during the removal process, the soil at site 2 is identified as hazardous, it will be disposed of in accordance with applicable regulations as identified in this evaluation. as such, on site disposal will not be the selected alternative.

6.0 PUBLIC RELATIONS

6.1 POINTS-OF-CONTACT

Engineering Field Activity Chesapeake
901 M Street SE
Bldg 212, Code 181
Washington D.C. 20374-5018
Frank Zepka
(202) 685-3279

Maryland Department of The Environment
Waste Management/Environmental Response & Restoration
2500 Broening Hwy.
Baltimore, MD 21224
Ed Carlson
(410)631-3496

US Environmental Protection Agency
(Mail Code 3HW31)
841 Chestnut Street
Philadelphia, PA 19107
Terry Stilman
(215) 597-8170

6.2 PUBLIC INFORMATION FILE

Specific sources of information may be requested from: Frank Zepka (202) 685-3279

6.3 ADMINISTRATIVE RECORD

The Administrative record is located at EFA Chesapeake, Bldg 212, Code 181, 901 M Street, SE, Washington DC 20374-5018

6.4 INFORMATION REPOSITORY

Decision documents such as this Engineering Evaluation/Cost Analysis, studies and related supporting documentation are available for public examination from the Information Repository maintained at the Perryville Public Library, 510 Broad Street, Perryville, MD.

6.5 PUBLIC COMMENT PERIOD

There will be a public comment period on this EE/CA from 11 June 1994 to 11 July 1994.

6.6 PUBLIC NOTICE

Public Notice of this EE/CA has been provided in the following ways:

Legal notice in Cecil Whig dated 9 June 1994
Legal notice in the Rising Sun Herald dated 15 June 1994

6.7 RESPONSIVENESS SUMMARY

The Responsiveness Summary will be completed following the completion of the public notice period

List of Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
COMAR	Code of Maryland
DCR	Dispersion by Chemical Reaction
EFA CHES	Engineering Field Activity Chesapeake
FML	Flexible membrane Liner
GW	Groundwater Well
HRS	Hazard Ranking System
MCL	Maximum Contaminant Levels
MDE	Maryland Department of the Environment
NCP	National Contingency Plan
NTC	Naval Training Center
PAH	Polynuclear Aromatic Hydrocarbons
RCRA	Resource Conservation and Recovery Act
Site 1	Old Landfill
Site 2	Fire Training Area
USDA	US Department of Agriculture

REVIEW COMMENTS

ENGINEERING EVALUATION/COST ANALYSIS

This pre-addressed form is provided for your convenience if you wish to submit written comments on the Engineering Evaluation/Cost Analysis for proposed environmental cleanup actions at the former Naval Training Center, Bainbridge.

A space is provided for your name, address, and phone number. While this information is optional, you are encouraged to provide it. It may help us to reach you so that we may clarify the meaning of your questions or comments, or to provide additional information to you. Comments received will become part of the public record, and will be incorporated into the Administrative Record maintained by the Navy and into Information Repository maintained for public access.

The Maryland Department of Environment (MDE) provides regulatory oversight to the Navy's environmental actions at NTC-Bainbridge. You may also wish to mail a copy of your comments to them at the following address:

MDE, Waste Management Administration
2500 Broening Highway
Baltimore, MD 21224

pg 1-4, Vol I - Future use of land may warrant use of contaminated groundwater as source aquifer. Navy could be liable as PRP. Wouldn't it be cost effective to remove contaminants or remediate groundwater for future use now rather than later?

pg 1-7, Vol I - Check to ensure contamination is not uphill of landfill.

pg 2-2 Vol I - When will groundwater be treated to attain MCLs?

pg 2-5 Vol I - Site 1 is an unlined landfill. Even with a FML cap, what's to keep other surface water from seeping around liner and leaching contaminants?

pg. 3-4 Vol. I - What kind of monitoring would be used to detect penetrations as the cap ages?

attach additional sheets if necessary

Name Vicki Strause
optional

Address 657 Keesey Lane, Perryville, MD 21903

Telephone No. _____

NAVY RESPONSE TO PUBLIC REVIEW COMMENTS

On June 10, 1994 the Navy released their Engineering Evaluation/Cost Analysis (EE/CA) concerning proposed Removal Actions for the two sites located on the former Naval Training Center - Bainbridge (NTC-Bainbridge) in Cecil County, Maryland.

The NTC-Bainbridge EE/CA public review and comment period was extended to 32 days, from June 11 through July 12. The following is the list of questions received by the Navy, and the responses.

1. (page 1-4, Volume I) Future use of land may warrant use of contaminated groundwater as source aquifer. Navy could be liable as Potentially Responsible Party (PRP). Wouldn't it be cost effective to remove contaminants or remediate groundwater for future use now rather than later?

In performing the proposed Removal Actions, it is the Navy's intent to eliminate pathways which contribute to risks from exposure to contaminants. Currently, rainwater is moving unhindered through the waste contained in the landfill, creating contaminated leachate that is entering both the surface waters and the groundwater. The purpose of capping the landfill with a Flexible Membrane Liner (FML) is to prevent the rainwater from percolating through the landfill, thus discontinuing the flow of contamination into the groundwater and surface waters. This removal action should reduce the concentration of contamination in the groundwater to below risk levels, as will become evident with the continued groundwater monitoring which the Navy will perform. The Remedial Investigation, which is scheduled for an April, 1995 release, will make a later, final assessment regarding the need for groundwater remediation; the subsequent Feasibility Study will determine the most cost-effective groundwater remediation, if it is warranted.

2. (page 1-7, Volume I) Check to ensure contamination is not uphill of landfill.

The Navy took groundwater, surface water, and sediment samples upgradient of the landfill along the northern stream, as indicated in the December 1991 draft Remedial Investigation Report. These samples exhibited no significant concentrations of regulated contaminants, and were used as background samples to characterize existing water conditions prior to any possible contamination by the landfill.

3. (page 2-2, Volume I) When will groundwater be treated to attain Maximum Contaminant Levels (MCL's)?

As stated in the EE/CA (page 2-2), for this removal action, "groundwater will not be treated to attain MCLs, however, sources of contaminants leading to their presence will be

addressed." Specifically, the contaminated leachate which is flowing out of the landfill and into the groundwater will be eliminated by preventing the flow of rainwater through the waste. Currently, the contaminated groundwater aquifer is not used for agricultural or drinking water purposes downgradiant of the landfill. The Navy, in conjunction with appropriate state agencies, will be responsible for continued groundwater monitoring to ensure that the contaminants have decreased to levels which pose no present or future risk. The Remedial Investigation will evaluate the need for groundwater treatment. Any treatment of groundwater would not be undertaken before a Record of Decision had been signed (to establish required remediation levels) and an appropriate treatment process had been designed.

4. (page 2-5, Volume I) Site 1 is an unlined landfill. Even with a Flexible Membrane Liner (FML) cap, what's to keep other surface water from seeping around liner and leaching contaminants?

In order to secure the FML and to ensure against surface water leakage under the liner, the edges of the FML will be placed in an anchor trench that surrounds the landfill. This anchor trench, which will be located outside the limits of the waste, will be dug three feet deep and two feet wide. The edge of the liner will then be placed into the trench, and clean soil will be compacted on top. Therefore, wastes within the landfill will be completely covered by the FML cap. In addition, the landfill slopes incorporated in the design direct rainwater runoff away from the cap in a drainage pattern that will prevent seepage under the liner.

5. (page 3-4, Volume I) What kind of monitoring would be used to detect penetrations as the cap ages?

To test for future releases of contaminants, the Navy will maintain groundwater monitoring wells around the perimeter and downgradient of the landfill. The Maryland Department of the Environment will also review the monitoring results to ensure that risk standards are not exceeded. Additionally, an operations and maintenance plan will be put into effect which will include control of plant growth (large trees or shrubs/vines) whose roots could penetrate the cap, and monitoring for changes in surface contours which could lead to subsidence and leakage.

DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY CHESAPEAKE
WASHINGTON NAVY YARD BUILDING 212
901 M STREET SE
WASHINGTON DC 20374-5018

IN REPLY REFER TO

ACTION MEMORANDUM

DATE: 29 June 99

FROM: Frank Peters, Code 181, Engineering Field Activity, Chesapeake, Naval Facilities Engineering Command

TO: Commanding Officer, Engineering Field Activity, Chesapeake, Naval Facilities Engineering Command

SUBJ: TIME CRITICAL REMOVAL ACTION

1. PURPOSE

This action memorandum describes a time critical removal action undertaken under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 40 CFR 300.415. The removal action addresses contaminated soils at four locations at the former Naval Training Center (NTC) Bainbridge, MD. The first location is the former site of two elevated water storage tanks. The second location is the former open storage/salvage yard or Area of Concern 2 (AOC 2). The third location is the former pesticide shop, identified as former building 683, or AOC 3. The fourth site, designated 707 in reference to the nearest building, is located in a wooded area. The removal action encompasses delineation of contamination, excavation of lead-contaminated soils in the vicinity of the former water towers, metals and polycyclic aromatic hydrocarbons (PAHs) at AOC 2, pesticide contaminated soils at AOC 3, lead contaminated soils at 707, off-site disposal, and confirmation sampling.

2. SITE DESCRIPTION

a. Background. NTC-Bainbridge was constructed and activated during the early 1940s as a training center for World War II recruits. Following the war, the 1,200 acre base went through one of several periods of reduced activity. During the Korean conflict training at the NTC increased. At various times, the mission of the NTC changed to meet the changing needs of the Navy. During the late 1960s, the base again entered a period of

reduced operations, and on June 30, 1976, the Naval Training Center was formally closed as a Navy installation.

From the late 1970s until 1990, the US Department of Labor operated a Job Corps training center on a portion of the Navy property. Selected Navy buildings were used as classrooms and dormitories for Job Corps trainees and utility services such as sewage treatment, water and electrical distribution were provided through Naval facilities.

b. Site Description. When the NTC was active, two elevated water towers were a key element of the water distribution system. Both towers stored water for daily use, and provided continuous pressure, without pumping, for routine distribution and for emergency fire-fighting capability. These elevated water storage tanks were located in the north and east ends of the NTC to take advantage of natural elevation, and were raised above ground to further enhance pressure to all service locations. One tower (known as "building" or facility no. 689) was a 51 ft diameter, 1.7 million gallon steel tank that rose to a height of 111 ft; it was located near the intersection of Worden Road and Downe Lane in the northwest end of the base, and served the nearby industrial area as well as training and general-purpose facilities to the south. The second water tower (identified as facility no. 1054) was a 28 ft diameter, 230 thousand gallon steel tank that rose to a height of 50 ft; it was located in the Manor Heights housing area on the east side of the base near Funk Road, and primarily served government housing in that area.

The open storage/salvage yard (AOC 2) was utilized to store scrap metal from use in base activities. Located in the far northern corner of the base near State Route 276, AOC 2 contains two 300 ft by 40 ft rectangular bins with walls 4 ft high. One of the bins does not have a 300 ft length of the wall, but does have the wall foundation. Coal ash/cinders served as a paving material where the scrap metal was stored.

The pesticide shop (AOC 3) was the central point for the storage and preparation of pesticides, and maintenance of related equipment. The shop, located in the north end of the base between Powers and Peebles Roads, was a one story, 3,185 ft^2 structure erected in 1942. The floor was a concrete slab, and the walls were a combination of concrete block, and wood framing covered with transite siding.

Located near the former building 707 and Fiske road, the 707 work area is forested with trees ranging in age from young saplings to old growth oaks. There is little evidence that human activity occurred on this site. The nearest development to the site is the foundation for building 707 located approximately 100 feet to the east. This facility was designated as an applied instructions building when the base was active. Two other nearby

buildings, 707C and 726, served as a hazardous/flammable storehouse and a general storage shed, respectively. All these buildings have since been removed, leaving only the foundations.

c. Current Use. Neither the water towers, nor the pesticide shop are in existence today. The steel water towers were demolished in the mid-1990s and recycled as scrap metal. The pesticide shop was demolished in November, 1990, as part of the base-wide asbestos abatement project. At the storage/salvage yard, only the cement walls of the bins remain. The lead contaminated site near the former building 707 was never a developed location. The site remains heavily wooded with several old growth trees nearby.

d. Status. In order to prepare the NTC property for transfer to the State of Maryland, an Environmental Baseline Survey (EBS) is being performed. Task I of the EBS ("EBS-I") conducted a review of past operations at the base through a records search, interviews with past employees and environmental regulators, and a physical survey of the 1,200 acre site. The EBS-I study identified various wastes and industrial products which were abandoned during the years of Navy and/or Job Corps operations. The wastes included abandoned containers of swimming pool disinfectant, empty casings from vandalized electrical transformers, paint cans, and empty drums from miscellaneous activities. The Navy awarded a contract to remove these wastes, and that cleanup action took place from March to June 1997.

The EBS-I report also identified several AOCs, areas where there was a potential that hazardous contamination had been released, but available documentation or other supporting information was inconclusive. During EBS Task II, a limited number of samples were collected and analyzed to identify and quantify any contamination detected at the AOCs.

Based upon the EBS-II analytical results the Navy proposed, the Maryland Department of Environment (MDE) and Region III of the US Environmental Protection Agency (EPA) agreed that the Navy would remove the lead-contaminated soils at the water towers without further study.

Also, data from the EBS-II pre-final report (EA, 1997) was compared to accepted contaminant screening levels. Based on this screening, MDE, EPA, and the Navy agreed to collect additional data at AOCs 2 and 3 and evaluate the elevated contaminant levels in terms of risk to human health and the environment. The additional sampling and evaluation was performed as a continuation of EBS Task II, and it was concluded that AOCs 2 and 3 had levels of contamination sufficiently elevated to warrant a cleanup action.

During the course of EBS sampling, background samples were collected from relatively undisturbed areas. Background samples provide a baseline for comparing naturally occurring elements such as iron, lead, manganese, and arsenic, which may be considered contaminants when found at elevated levels. The elevated lead levels at 707 were inadvertently detected during collection of background samples.

e. Release Description. The two water towers, constructed in 1942 and 1954, had been in use for a number of years before the NTC ceased operation in 1976. For purposes of preventative maintenance, the steel towers were painted several times with lead-based paints as a rust-preventative measure. Prior to these paintings, it was common practice to scrape or sandblast any rust or weakened paint from the steel surfaces. At the time, it was also common practice to let the removed paint fall to the ground without containment. A total of ten (10) soil samples were collected beneath the two water towers. A lead value of 400 mg/kg (milligrams of lead in a kilogram of soil) is generally considered to be the screening level for residential soils. Results for the 10 samples ranged from a low of 470 to a high of 40,100 mg/kg.

The Open Storage/Salvage Yard (AOC 2) was used to store scrap metal on a surface paved with coal ash/cinders. Consequently, this area was suspect for the presence of elevated metals and/or polycyclic aromatic hydrocarbon (PAH) concentrations in surrounding soils. Thirteen surface soil samples were taken for analysis of metals and PAHs at AOC 2. Contaminants that exceeded screening levels were designated as Contaminants of Potential Concern (COPC) for which Proposed Remediation Goals (PRGs) could be set. The Navy has proposed to clean this site to levels protective of human health in a future residential setting. For AOC 2, the COPCs and their associated PRGs were antimony-27 mg/kg, lead-400 mg/kg, and benzo(a)pyrene-2.0 mg/kg.

For the pesticide shop (AOC 3), the Navy has no specific knowledge of any spills or mishaps that may have occurred between 1942 and 1976. An interview with one of the Navy's past shop supervisors did not indicate that any significant spills had occurred on the site during his tenure. Fourteen surface soil samples were collected near AOC 3 and analyzed for Target Compound List (TCL) pesticides. These COPCs and their proposed PRGs are DDT-4.3 mg/kg, DDE-16.3 mg/kg, DDD-23.1 mg/kg, Alpha Chlordane-4.1 mg/kg, Gamma Chlordane-4.1 mg/kg, and Heptachlor Epoxide-0.4 mg/kg.

The initial sample near building 707 was a background sample. The area of known contamination is surrounded by several mature trees, and no organized activity is known to have operated in this immediate area. Known buildings nearby were a recruit training facility, and a hazardous/flammable storehouse.

Overall, the Navy can only speculate on the origins of this contamination. The initial sample detected lead at 10,000 mg/kg. Eight additional samples were collected on a 5 foot rectangular grid surrounding the first sample; those results ranged from 1,200 to 27,800 mg/kg. The Navy proposes to clean this site to 400 mg/kg of lead.

3. THREATS TO PUBLIC HEALTH OR THE ENVIRONMENT

a. Threats to Public Health and Welfare. When the water towers were repainted, previous paint coatings would first be removed, and consequently, lead-based paint accumulated around the base of the towers. In order to affect human health, the lead would have to be ingested or inhaled. This would require direct contact with the paint residue or inhalation of paint particulates in the air near the site. Dermal effects are generally minimal due to lead's negligible extent of dermal absorption. In elevated doses, lead can effect blood pressure, the nervous system, the gastrointestinal tract, and heart rhythms.

At the Storage/Salvage Yard (AOC 2), antimony, lead, and benzo(a)pyrene were determined to be the target PRG contaminants as computed in the Streamlined Human Health Risk Assessment (S-HHRA). Significant contact with these contaminants would most likely occur in a residential setting by exposure to local hotspots. No human data and inadequate data from animal bioassays exists on the carcinogenicity of antimony, and it is therefore listed only as a non-cancer contaminant. Information on lead's health effects is discussed in the preceding paragraph. Benzo(a)pyrene is listed as a cancer contaminant only and has been classified as a probable human carcinogen by the EPA. Arsenic and iron were also found to exist on the site, however, only 2 of 13 sample locations varied statistically from background levels. As such, EPA's risk assessment guidance does not require that PRGs be developed for arsenic and iron. Because these two sample locations exceeded computed PRG values for one or more other contaminants, they will be cleaned to the computed PRG values for the other contaminants, and arsenic and iron concentrations will be incidentally reduced during the same operation.

At the Pesticide Shop (AOC 3), chronic hazard indices for health effects other than cancer were estimated for child residents exposed to COPCs in surface soil via incidental ingestion and dermal contact with surface soil. The total noncancer risk for children was greater than one (HI of 3.7) under reasonable maximum exposure (RME) conditions. DDT was the major risk driver for future residential children, with the liver being the target organ. Lifetime cancer risks for residential children fell within the acceptable range. For adults, the total noncancer risk was less than one under RME conditions (HI of 0.3). There are no excess cancer risks for adult residents at AOC 3.

Elevated lead levels present the health hazard at 707. These potential dangers would be similar as for the water tower site described previously.

b. Threats to the Environment. For the water tower site, the primary concern is lead contamination in the surrounding soil. Lead's chemistry, fate, and transport in the environment are strongly dependent upon local soil conditions (RI Report-Ecology and Environment, 1999). Generally, lead will absorb strongly to soil particles, and will not be transported in the aqueous phase. Under acidic conditions, leaching to groundwater is possible. Other mobilization pathways include runoff with suspended sediments and wind driven launching as airborne dust. When airborne, lead is usually in the particulate form (RI Report-Ecology and Environment, 1999). Studies have shown that lead can lead to tumors in animals (S-HHRA, 1999).

At AOC 2, in addition to lead, antimony and benzo(a)pyrene are of primary concern. The environmental effects of lead have been detailed in the preceding paragraph. Antimony has been classified as a danger to the environment by the Nordic Council of Ministers. Specifically, antimony tends to persist within the environment and bioaccumulate in organisms. Benzo(a)pyrene, a byproduct of incomplete combustion, most likely arrived at this site with the ash paving material. Benzo(a)pyrene is the most toxic Polycyclic Aromatic Hydrocarbon (PAH) to animals. In a pure state, it is virtually insoluble in water (S-HHRA, 1999).

AOC 3 is contaminated with three isomers of DDT, alpha and gamma chlordane, and heptachlor epoxide. DDT has been banned in the United States since 1973. The three isomers of DDT have low solubility's as well as strong tendencies to bond to soil, and therefore generally do not leach into groundwater or become mobilized in the aqueous phase. Once airborne, DDE and DDT can attach to small particulates, but are removed through wet deposition. The DDT isomers greatest danger to the environment is their ability to bioaccumulate in terrestrial and aquatic organisms (RI Report-Ecology and Environment, 1999). Heptachlor epoxide is the major transformation derivative of the pesticide heptachlor. Heptachlor epoxide is largely resistant to all types of transformation, as well as vaporization, and therefore is relatively stable in the environment. What degradation does occur is largely through photolysis, hydrolysis, and biodegradation (RI Report-Ecology and Environment, 1999). Alpha and gamma chlordane have similar toxic mechanisms as heptachlor epoxide (Pinkney, 1999).

The lead contamination at 707 would have similar dangers to the environment as described for the water tower site.

4. NO ACTION ALTERNATIVE

Taking no action at these locations would continue the potential exposure of people to the contaminants. Although a negative impact to the environment has not been observed, it cannot be assured that no negative impacts would occur.

5. PROPOSED ACTIONS AND COSTS

a. Proposed Actions. For the four sites, the Navy is proposing to clean to levels protective of human health in a future residential setting. To mitigate the potential exposure risk, contaminated soils that exceed the target PRGs will be excavated and disposed in an appropriate, approved landfill. In locations where contaminants are irregularly distributed, the Navy's approach will be to excavate contaminated soils at selected locations in accordance with the target PRGs.

b. Proposed Project Schedule. Lead removal at the water towers was completed on December 10, 1998, when the last confirmation samples were shipped. Work at AOC 2, AOC 3, and 707 is expected to be complete on July 15, 1999.

c. Estimated Costs. Cost for cleanup of the lead contamination at the water towers is approximately $45,000. Removal of contaminated soils at AOC 2 is expected to cost approximately $65,000. Pesticide removal at AOC 3 is expected to cost approximately $250,000. Cleanup costs for 707 are expected to be about $30,000.

For each of these actions, the estimated costs include labor costs, equipment rentals, per diem and travel expenses, laboratory analyses and on-site sampling, off-site disposal of contaminated materials, close-out reports, temporary facilities, site restoration, and contractor's profit.

d. Alternative Actions Considered. Alternative actions considered included taking no action; bioremediation of pesticides, which could not be successfully completed in time to meet the target date for property transfer; and on-site encapsulation of metals using soil solidification/stabilization procedures. Use of either alternative action would permit the contaminants to remain on site in a non-mobile state. Neither option provided a cost savings when compared to the proposed actions.

6. RECOMMENDATION

Conditions at this site meet the criteria for a removal action as defined in the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR 300.415(b)(2). As such, this removal action is submitted for approval.

Approvals:

Environmental:
EFA Chesapeake

Frank R. Peters
Manager,
Environmental Restoration Branch

Date: 6/29/99

Commanding Officer:
EFA Chesapeake

Paul McMahon, Jr.
Captain, CEC, USN

Date: 6/29/99

REFERENCES

EA Engineering, Science, and Technology. 1999. Final Streamlined Human Health Risk Assessment AOCs 2, 3, and 6, Naval Training Center-Bainbridge. Sparks, MD.

EA Engineering, Science, and Technology. 1997. Environmental Baseline Survey-II Pre-Final Report.

Ecology and Environment. 1999. Final Remedial Investigation Report for Bainbridge Naval Training Center, Port Deposit, Maryland. Arlington, VA.

McGee, Beth. 1999. Summary of a Possible Cleanup Strategy-Open Salvage/Storage Yard (Area of Concern 2), Bainbridge Naval Training Center, Port Deposit, Maryland. U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD.

Pinkney, Fred. 1999. Summary of a Possible Cleanup Goals-Pesticide Shop (Area of Concern 3), Bainbridge Naval Training Center, Port Deposit, Maryland. U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD.

MEMORANDUM 29 June 1999

From: Code 181 6/30
TO; Code 00 BBC
Via: Code 90, 09C, 09
B 6/30 BCC 6/30
Subj: MISCELLANIOUS BAINBRIDGE REMEDIAITIONS

Encl: (1) Action Memorandum dated 29 June 1999 for tije Critical Removal Actions at NTC Bainbridge

1. The enclosed Action Memorandum is forwarded for your signature. It documents completed and ongoing remediations at Bainbridge. After signature, we will include this with the Bainbridge Administrative Record and will also make it available to the public with the information repository. The actions it describes have already been coordinated and agreed to with EPA Region III. If you have any questions, please call either me at 685-3245 or Frank Zepka at 685-3279.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

January 7, 1994

SUBJECT: Risk-Based Concentration Table, First Quarter 1994

FROM: Roy L. Smith, Ph.D., Senior Toxicologist
Technical Support Section (3HW13)

TO: RBC Table mailing list

Attached is the EPA Region III risk-based concentration table, which we have distributed quarterly to all interested parties since 1991. If you are not currently on the mailing list, but would like to be, please contact Anna Poulton (phone: 215-597-3179, fax: 215-597-9890) and give her your name, address, and phone and fax numbers.

The table contains reference doses and carcinogenic potency slopes (obtained from IRIS through January 1, 1994, HEAST through July 1993, OHEA-Cincinnati, and other EPA sources) for nearly 600 chemicals. These toxicity constants have been combined with "standard" exposure scenarios to calculate chemical concentrations corresponding to fixed levels of risk (*i.e.*, a hazard quotient of 1, or lifetime cancer risk of 10^{-6}, whichever occurs at a lower concentration) in water, air, fish tissue, and soil.

The Region III toxicologists use this table as a risk-based screen for Superfund sites, and as a desk reference for emergencies and requests for immediate information. The table also provides a useful benchmark for evaluating site investigation data and preliminary remediation goals. The table has no official status as either regulation or guidance, and should be used only as a predictor of generic single-contaminant health risk estimates. *The table is specifically not intended as (1) a stand-alone decision-making tool, (2) a substitute for EPA guidance for preparing baseline risk assessments, (3) a source of site-specific cleanup levels, or (4) a rule to determine if a waste is hazardous under RCRA.* In general, chemical concentrations above the levels in the table suggest a need for a closer look by a toxicologist, but should not be used as the sole basis for taking any action.

The toxicity information in the table has been assembled by hand, and (despite extensive checking and years of use) may contain errors. It's advisable to cross-check before relying on any numbers in the table. If you find any errors, please send me a note.

This issue of the table is printed in a new format, which was developed because it fits more information on each page, while (hopefully) retaining legibility. The table now includes the CAS number of each contaminant, which should reduce confusion about multi-named compounds. Also, each risk-based concentration is now accompanied by a footnote indicating its basis, whether carcinogenic or non-carcinogenic effects. Finally, all newly revised risk-based concentrations have been placed in shaded boxes for quick recognition, rather than summarized here.

I'd like to express my appreciation to all the users of the RBC Table who have contributed suggestions for improvements over the last three years. I hope your continued interest will help us make the table even better in the future. Have a great 1994!

Attachment

Risk-Based Concentration Table
Background Information

General: Separate carcinogenic and non-carcinogenic risk-based concentrations were calculated for each compound for each pathway. The concentration in the table is the lower of the two, rounded to two significant figures. The following terms and values were used in the calculations:

Exposure variables	Value	Name
1-General:		
Carcinogenic potency slope oral (kg-d/mg):	*	CPSo
Carcinogenic potency slope inhaled (kg-d/mg):	*	CPSi
Reference dose oral (mg/kg/d):	*	RfDo
Reference dose inhaled (mg/kg/d):	*	RfDi
Target cancer risk:	1e-06	TR
Target hazard quotient:	1	THQ
Body weight, adult (kg):	70	BWa
Body weight, age 1-6 (kg):	15	BWc
Averaging time carcinogens (d):	25550	ATc
Averaging time non-carcinogens (d):	ED*365	ATn
Inhalation, adult (m3/d):	20	IRAa
Inhalation, child (m3/d):	12	IRAc
Inhalation factor, age-adjusted (m3-y/kg-d):	11.66	IFAadj
Tap water ingestion, adult (L/d):	2	IRWa
Tap water ingestion, age 1-6 (L/d):	1	IRWc
Tap water ingestion factor, age-adjusted (L-y/kg-d):	1.09	IFWadj
Fish ingestion (g/d):	54	IRF
Soil ingestion, adult (mg/d):	100	IRSa
Soil ingestion, age 1-6 (mg/d):	200	IRSc
Soil ingestion factor, age adjusted (mg-y/kg-d):	114.29	IFSadj
2-Residential:		
Exposure frequency (d/y):	350	EFr
Exposure duration, total (y):	30	EDtot

Exposure variables	Value	Name
Exposure duration, age 1-6 (y):	6	EDc
Volatilization factor (L/m3):	0.5	VF
3-Occupational:		
Exposure frequency (d/y):	250	EFo
Exposure duration (y):	25	EDo
* = Contaminant-specific toxicity parameters		

The priority among sources of toxicological constants was as follows: (1) IRIS, (2) HEAST, (3) HEAST alternative method, (4) ECAO-Cincinnati, (5) withdrawn from IRIS, (6) withdrawn from HEAST, and (7) other EPA documents. Each source was used only if numbers from higher-priority sources were unavailable.

Algorithms:

1. Age-adjusted factors: Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors. These factors approximated the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age-adjusted factor for soil was obtained from RAGS IB; the others were developed by analogy.

a. Air inhalation ($[m^3 \cdot y]/[kg \cdot d]$):

$$IFAadj = \frac{EDc \cdot IRAc}{BWc} + \frac{(EDtot - EDc) \cdot IRAa}{BWa}$$

b. Tap water ingestion ($[L \cdot y]/[kg \cdot d]$):

$$IFWadj = \frac{EDc \cdot IRWc}{BWc} + \frac{(EDtot - EDc) \cdot IRWa}{BWa}$$

c. Soil ingestion ($[mg \cdot y]/[kg \cdot d]$):

$$IFSadj = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

2. Residential water use ($\mu g/L$). Volatilization terms were calculated only for compounds with "***" in the "VOC" column. Compounds having a Henry's Law constant greater than 10^{-5} were considered volatile. The list may be incomplete, but is unlikely to include false positives. The equations and the volatilization factor (VF, above) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. Inhaled potency slopes were substituted for unavailable oral potency slopes only for volatile compounds; inhaled RfDs were substituted for unavailable oral RfDs for both volatile and non-volatile compounds.

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc \cdot 1000\frac{ug}{mg}}{EFr \cdot ([VF \cdot IFAadj \cdot CPSi] + [IFWadj \cdot CPSo])}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot BWa \cdot ATn \cdot 1000\frac{ug}{mg}}{EFr \cdot EDtot \cdot \left(\frac{VF \cdot IRAa}{RfDi} + \frac{IRWa}{RfDo}\right)}$$

3. Air ($\mu g/m^3$). Oral potency slopes and references were used where inhalation values were not available.

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc \cdot 1000\frac{ug}{mg}}{EFr \cdot IFAadj \cdot CPSi}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot RfDi \cdot BWa \cdot ATn \cdot 1000\frac{ug}{mg}}{EFr \cdot EDtot \cdot IRAa}$$

4. Fish (mg/kg):

a. Carcinogens: Calculations were based on adult exposure.

$$\frac{TR \cdot BWa \cdot ATc}{EFr \cdot EDtot \cdot \frac{IRF}{1000\frac{g}{kg}} \cdot CPSo}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFr \cdot EDtot \cdot \frac{IRF}{1000\frac{g}{kg}}}$$

5. Soil commercial/industrial (mg/kg): The default exposure assumption that only 50% of incidental soil ingestion occurs at work has been omitted. Calculations were based on adult occupational exposure.

a. Carcinogens:

$$\frac{TR \cdot BWa \cdot ATc}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}} \cdot CPSo}$$

b. Non-carcinogens:

$$\frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}}}$$

6. Soil residential (mg/kg):

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc}{EFr \cdot \frac{IFSadj}{10^6\ \frac{mg}{kg}} \cdot CPSo}$$

b. Non-carcinogens: Calculations were based on childhood exposure only.

$$\frac{THQ \cdot RfDo \cdot BWc \cdot ATn}{EFr \cdot EDc \cdot \frac{IRSc}{10^6\ \frac{mg}{kg}}}$$

Sources: i=IRIS h=HEAST s=HEAST alt. x=W/D from IRIS y= W/D from HEAST e=EPA–ECAO o=Other EPA docs. *Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Acephate	30560191	4.00E–03 *i*		8.70E–03 *i*			7.7 *c*	0.72 *c*	0.36 *c*	330 *c*	73 *c*
Acetaldehyde	75070		2.57E–03 *i*		7.70E–03 *i*		94 *n*	0.81 *c*			
Acetochlor	34256821	2.00E–02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Acetone	67641	1.00E–01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Acetone cyanohydrin	75865	7.00E–02 *h*	2.86E–03 *h*				2600 *n*	10 *n*	95 *n*	72000 *n*	5500 *n*
Acetonitrile	75078	6.00E–03 *i*	1.43E–02 *h*				220 *n*	52 *n*	8.1 *n*	6100 *n*	470 *n*
Acetophenone	98862	1.00E–01 *i*	5.71E–06 *w*			***	0.042 *n*	0.021 *n*	140 *n*	100000 *n*	7800 *n*
Acifluorfen	62476599	1.30E–02 *i*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Acrolein	107028	2.00E–02 *h*	5.71E–06 *i*				730 *n*	0.021 *n*	27 *n*	20000 *n*	1600 *n*
Acrylamide	79061	2.00E–04 *i*		4.50E+00 *i*	4.55E+00 *i*		0.015 *c*	0.0014 *c*	0.0007 *c*	0.64 *c*	0.14 *c*
Acrylic acid	79107	8.00E–02 *i*	8.57E–05 *i*				2900 *n*	0.31 *n*	110 *n*	82000 *n*	6300 *n*
Acrylonitrile	107131		5.71E–04 *i*	5.40E–01 *i*	2.38E–01 *i*		0.12 *c*	0.026 *c*	0.0058 *c*	5.3 *c*	1.2 *c*
Alachlor	15972608	1.00E–02 *i*		8.00E–02 *h*			0.84 *c*	0.078 *c*	0.039 *c*	36 *c*	8 *c*
Alar	1596845	1.50E–01 *i*					5500 *n*	550 *n*	200 *n*	150000 *n*	12000 *n*
Aldicarb	116063	1.00E–03 *i*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Aldicarb sulfone	1646884	1.00E–03 *i*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Aldrin	309002	3.00E–05 *i*		1.70E+01 *i*	1.71E+01 *i*		0.004 *c*	0.00037 *c*	0.00019 *c*	0.17 *c*	0.038 *c*
Ally	74223646	2.50E–01 *i*					9100 *n*	910 *n*	340 *n*	260000 *n*	20000 *n*
Allyl alcohol	107186	5.00E–03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Allyl chloride	107051	5.00E–02 *w*	2.86E–04 *i*				1800 *n*	1 *n*	68 *n*	51000 *n*	3900 *n*
Aluminum	7429905	2.90E+00 *o*					110000 *n*	11000 *n*	3900 *n*	1000000 *n*	230000 *n*
Aluminum phosphide	20859738	4.00E–04 *i*					15 *n*	1.5 *n*	0.54 *n*	410 *n*	31 *n*
Amdro	67485294	3.00E–04 *i*					11 *n*	1.1 *n*	0.41 *n*	310 *n*	23 *n*
Ametryn	834128	9.00E–03 *i*					330 *n*	33 *n*	12 *n*	9200 *n*	700 *n*
m–Aminophenol	591275	7.00E–02 *h*					2600 *n*	260 *n*	95 *n*	72000 *n*	5500 *n*
4–Aminopyridine	504245	2.00E–05 *h*					0.73 *n*	0.073 *n*	0.027 *n*	20 *n*	1.6 *n*
Amitraz	33089611	2.50E–03 *i*					91 *n*	9.1 *n*	3.4 *n*	2600 *n*	200 *n*
Ammonia	7664417		2.86E–02 *i*				1000 *n*	100 *n*			
Ammonium sulfamate	7773060	2.00E–01 *i*					7300 *n*	730 *n*	270 *n*	200000 *n*	16000 *n*
Aniline	62533		2.86E–04 *i*	5.70E–03 *i*			10 *n*	1 *n*	0.55 *c*	500 *c*	110 *c*
Antimony and compounds	7440360	4.00E–04 *i*					15 *n*	1.5 *n*	0.54 *n*	410 *n*	31 *n*
Antimony pentoxide	1314609	5.00E–04 *h*					18 *n*	1.8 *n*	0.68 *n*	510 *n*	39 *n*
Antimony potassium tartrate	304610	9.00E–04 *h*					33 *n*	3.3 *n*	1.2 *n*	920 *n*	70 *n*
Antimony tetroxide	1332315	4.00E–04 *h*					15 *n*	1.5 *n*	0.54 *n*	410 *n*	31 *n*
Antimony trioxide	1309644	4.00E–04 *h*					15 *n*	1.5 *n*	0.54 *n*	410 *n*	31 *n*
Apollo	74115245	1.30E–02 *i*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Aramite	140578	5.00E–02 *h*		2.50E–02 *i*	2.49E–02 *i*		2.7 *c*	0.25 *c*	0.13 *c*	110 *c*	26 *c*
Arsenic	7440382	3.00E–04 *i*					11 *n*	1.1 *n*	0.41 *n*	310 *n*	23 *n*
Arsenic (as carcinogen)	744032	3.00E–04		1.75E+00 *i*	1.51E+01 *i*		0.038 *c*	0.00041 *c*	0.0018 *c*	1.6 *c*	0.37 *c*
Assure	76578148	9.00E–03 *i*					330 *n*	33 *n*	12 *n*	9200 *n*	700 *n*
Asulam	3337711	5.00E–02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Atrazine	1912249	3.50E–02 *i*		2.22E–01 *h*			0.3 *c*	0.028 *c*	0.014 *c*	13 *c*	2.9 *c*

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Avermectin B1	65195553	4.00E-04 *i*					15 *n*	1.5 *n*	0.54 *n*	410 *n*	31 *n*
Azobenzene	103333			1.10E-01 *i*	1.08E-01 *i*		0.61 *c*	0.058 *c*	0.029 *c*	26 *c*	5.8 *c*
Barium and compounds	7440393	7.00E-02 *i*	1.43E-04 *h*				2600 *n*	0.52 *n*	95 *n*	72000 *n*	5500 *n*
Baygon	114261	4.00E-03 *i*					150 *n*	15 *n*	5.4 *n*	4100 *n*	310 *n*
Bayleton	43121433	3.00E-02 *i*					1100 *n*	110 *n*	41 *n*	31000 *n*	2300 *n*
Baythroid	68359375	2.50E-02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Benefin	1861401	3.00E-01 *i*					11000 *n*	1100 *n*	410 *n*	310000 *n*	23000 *n*
Benomyl	17804352	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Bentazon	25057890	2.50E-03 *i*					91 *n*	9.1 *n*	3.4 *n*	2600 *n*	200 *n*
Benzaldehyde	100527	1.00E-01 *i*				***	610 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Benzene	71432		1.43E-04 *e*	2.90E-02 *i*	2.90E-02 *i*	***	0.36 *c*	0.22 *c*	0.11 *c*	99 *c*	22 *c*
Benzidine	92875	3.00E-03 *i*		2.30E+02 *i*	2.35E+02 *i*		0.00029 *c*	0.000027 *c*	0.000014 *c*	0.012 *c*	0.0028 *c*
Benzoic acid	65850	4.00E+00 *i*					150000 *n*	15000 *n*	5400 *n*	1000000 *n*	310000 *n*
Benzotrichloride	98077			1.30E+01 *i*			0.0052 *c*	0.00048 *c*	0.00024 *c*	0.22 *c*	0.049 *c*
Benzyl alcohol	100516	3.00E-01 *h*					11000 *n*	1100 *n*	410 *n*	310000 *n*	23000 *n*
Benzyl chloride	100447			1.70E-01 *i*		***	0.062 *c*	0.037 *c*	0.019 *c*	17 *c*	3.8 *c*
Beryllium and compounds	7440417	5.00E-03 *i*		4.30E+00 *i*	8.40E+00 *i*		0.016 *c*	0.00075 *c*	0.00073 *c*	0.67 *c*	0.15 *c*
Bidrin	141662	1.00E-04 *i*					3.7 *n*	0.37 *n*	0.14 *n*	100 *n*	7.8 *n*
Biphenthrin (Talstar)	82657043	1.50E-02 *i*					550 *n*	55 *n*	20 *n*	15000 *n*	1200 *n*
1,1-Biphenyl	92524	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Bis(2-chloroethyl)ether	111444			1.10E+00 *i*	1.16E+00 *i*	***	0.0092 *c*	0.0054 *c*	0.0029 *c*	2.6 *c*	0.58 *c*
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 *i*		7.00E-02 *h*	3.50E-02 *h*	***	0.26 *c*	0.18 *c*	0.045 *c*	41 *c*	9.1 *c*
Bis(chloromethyl)ether	542881			2.20E+02 *i*	2.17E+02 *i*	***	0.000049 *c*	0.000029 *c*	0.000014 *c*	0.013 *c*	0.0029 *c*
Bis(2-chloro-1-methylethyl)ether				7.00E-02 *w*	7.00E-02 *w*		0.96 *c*	0.089 *c*	0.045 *c*	41 *c*	9.1 *c*
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 *i*		1.40E-02 *i*			4.8 *c*	0.45 *c*	0.23 *c*	200 *c*	46 *c*
Bisphenol A	80057	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Boron (and borates)	7440428	9.00E-02 *i*	5.71E-03 *h*				3300 *n*	21 *n*	120 *n*	92000 *n*	7000 *n*
Boron trifluoride	7637072		2.00E-04 *h*				7.3 *n*	0.73 *n*			
Bromodichloromethane	75274	2.00E-02 *i*		6.20E-02 *i*		***	0.17 *c*	0.1 *c*	0.051 *c*	46 *c*	10 *c*
Bromoethene	593602				1.10E-01 *h*	***	0.096 *c*	0.057 *c*			
Bromoform (tribromomethane)	75252	2.00E-02 *i*		7.90E-03 *i*	3.85E-03 *i*	***	2.4 *c*	1.6 *c*	0.4 *c*	360 *c*	81 *c*
Bromomethane	74839	1.40E-03 *i*	1.43E-03 *i*			***	8.7 *n*	5.2 *n*	1.9 *n*	1400 *n*	110 *n*
4-Bromophenyl phenyl ether	101553	5.80E-02 *o*					2100 *n*	210 *n*	78 *n*	59000 *n*	4500 *n*
Bromophos	2104963	5.00E-03 *h*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Bromoxynil	1689845	2.00E-02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Bromoxynil octanoate	1689992	2.00E-02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
1,3-Butadiene	106990				9.80E-01 *i*	***	0.011 *c*	0.0064 *c*			
1-Butanol	71363	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Butyl benzyl phthalate	85687	2.00E-01 *i*					7300 *n*	730 *n*	270 *n*	200000 *n*	16000 *n*
Butylate	2008415	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
sec-Bu ene	135988	1.00E-02 *e*				***	61 *n*	37 *n*	14 *n*		780 *n*
tert-Bu ene	104518	1.00E-02 *e*				***	61 *n*	37 *n*	14 *n*		780 *n*

Sources: i=IRIS h=HEAST a=HEAST alt. x=W/D from IRIS y=W/D from HEAST e=EPA-ECAO o=Other EPA docs. *Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Butylphthalyl butylglycolate	85701	1.00E+00 *i*					37000 *n*	3700 *n*	1400 *n*	1000000 *n*	78000 *n*
Cacodylic acid	75605	3.00E-03 *h*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
Cadmium and compounds	7440439	5.00E-04 *i*			6.30E+00 *i*		18 *n*	0.00099 *c*	0.68 *n*	510 *n*	39 *n*
Caprolactam	105602	5.00E-01 *i*					18000 *n*	1800 *n*	680 *n*	510000 *n*	39000 *n*
Captafol	2425061	2.00E-03 *i*		8.60E-03 *h*			7.8 *c*	0.73 *c*	0.37 *c*	330 *c*	74 *c*
Captan	133062	1.30E-01 *i*		3.50E-03 *h*			19 *c*	1.8 *c*	0.9 *c*	820 *c*	180 *c*
Carbaryl	63252	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Carbazole	86748			2.00E-02 *h*			3.4 *c*	0.31 *c*	0.16 *c*	140 *c*	32 *c*
Carbofuran	1563662	5.00E-03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Carbon disulfide	75150	1.00E-01 *i*	2.86E-03 *h*			***	21 *n*	10 *n*	140 *n*	100000 *n*	7800 *n*
Carbon tetrachloride	56235	7.00E-04 *i*	5.71E-04 *a*	1.30E-01 *i*	5.25E-02 *i*	***	0.16 *c*	0.12 *c*	0.024 *c*	22 *c*	4.9 *c*
Carbosulfan	55285148	1.00E-02 *i*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
Carboxin	5234684	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Chloral	75876	2.00E-03 *i*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
Chloramben	133904	1.50E-02 *i*					550 *n*	55 *n*	20 *n*	15000 *n*	1200 *n*
Chloranil	118752			4.03E-01 *h*			0.17 *c*	0.016 *c*	0.0078 *c*	7.1 *c*	1.6 *c*
Chlordane	57749	6.00E-05 *i*		1.30E+00 *i*	1.29E+00 *i*		0.052 *c*	0.0049 *c*	0.0024 *c*	2.2 *c*	0.49 *c*
Chlorimuron-ethyl	90982324	2.00E-02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Chlorine dioxide	10049044		5.71E-05 *i*				2.1 *n*	0.21 *n*			
Chloroacetaldehyde	107200	6.90E-03 *o*					250 *n*	25 *n*	9.3 *n*	7100 *n*	540 *n*
Chloroacetic acid	79118	2.00E-03 *h*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
2-Chloroacetophenone	532274		8.57E-06 *i*				0.31 *n*	0.031 *n*			
4-Chloroaniline	106478	4.00E-03 *i*					150 *n*	15 *n*	5.4 *n*	4100 *n*	310 *n*
Chlorobenzene	108907	2.00E-02 *i*	5.71E-03 *h*			***	39 *n*	21 *n*	27 *n*	20000 *n*	1600 *n*
Chlorobenzilate	510156	2.00E-02 *i*		2.70E-01 *h*	2.70E-01 *h*		0.25 *c*	0.023 *c*	0.012 *c*	11 *c*	2.4 *c*
p-Chlorobenzoic acid	74113	2.00E-01 *h*					7300 *n*	730 *n*	270 *n*	200000 *n*	16000 *n*
4-Chlorobenzotrifluoride	98566	2.00E-02 *h*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
2-Chloro-1,3-butadiene	126998	2.00E-02 *h*	2.00E-03 *h*			***	14 *n*	7.3 *n*	27 *n*	20000 *n*	1600 *n*
1-Chlorobutane	109693	4.00E-01 *h*				***	2400 *n*	1500 *n*	540 *n*	410000 *n*	31000 *n*
Chlorodifluoromethane	75456		1.43e+01 *i*			***	87000 *n*	52000 *n*			
Chloroethane	75003	2.00E-02 *e*	2.86E+00 *i*			***	710 *n*	10000 *n*	27 *n*	20000 *n*	1600 *n*
2-Chloroethyl vinyl ether	110758	2.50E-02 *o*				***	150 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Chloroform	67663	1.00E-02 *i*		6.10E-03 *i*	8.05E-02 *i*	***	0.15 *c*	0.078 *c*	0.52 *c*	470 *c*	100 *c*
Chloromethane	74873			1.30E-02 *h*	6.30E-03 *h*	***	1.4 *c*	0.99 *c*	0.24 *c*	220 *c*	49 *c*
4-Chloro-2,2-methylaniline hydrochloride	3165933			4.60E-01 *h*			0.15 *c*	0.014 *c*	0.0069 *c*	6.2 *c*	1.4 *c*
4-Chloro-2-methylaniline	95692			5.80E-01 *h*			0.12 *c*	0.011 *c*	0.0054 *c*	4.9 *c*	1.1 *c*
beta-Chloronaphthalene	91587	8.00E-02 *i*					2900 *n*	290 *n*	110 *n*	82000 *n*	6300 *n*
o-Chloronitrobenzene	88733			2.50E-02 *h*		***	0.42 *c*	0.25 *c*	0.13 *c*	110 *c*	26 *c*
p-Chloronitrobenzene	121733			1.80E-02 *h*		***	0.59 *c*	0.35 *c*	0.18 *c*	160 *c*	35 *c*
2-Chlorophenol	95578	5.00E-03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
2-Chloropropane	75296		2.86E-02 *h*			***	170 *n*	100 *n*			
Chlorothalonil	1897456	1.50E-02 *i*		1.10E-02 *h*			6.1 *c*	0.57 *c*	0.29 *c*	260 *c*	58 *c*

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
o-Chlorotoluene	95498	2.00E-02 i				***	120 n	73 n	27 n	20000 n	1600 n
Chlorpropham	101213	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Chlorpyrifos	2921882	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
Chlorpyrifos-methyl	5598130	1.00E-02 h					370 n	37 n	14 n	10000 n	780 n
Chlorsulfuron	64902723	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Chlorthiophos	60238564	8.00E-04 h					29 n	2.9 n	1.1 n	820 n	63 n
Chromium III and compounds	16065831	1.00E+00 i	5.71E-07 w				37000 n	0.0021 n	1400 n	1000000 n	78000 n
Chromium VI and compounds	7440473	5.00E-03 i			4.20E+01 i		180 n	0.00015 o	6.8 n	5100 n	390 n
Coal tar	8001589				2.20E+00 w			0.0028 o			
Coke Oven Emissions	8007452				2.17E+00 i			0.0029 c			
Copper and compounds	7440508	3.71E-02 h					1400 n	140 n	50 n	38000 n	2900 n
Crotonaldehyde	123739	1.00E-02 w		1.90E+00 h	1.90E+00 w		0.035 c	0.0033 o	0.0017 c	1.5 c	0.34 c
Cumene	98828	4.00E-02 i	2.57E-03 h				1500 n	9.4 n	54 n	41000 n	3100 n
Cyanides:											
Barium cyanide	542621	1.00E-01 h					3700 n	370 n	140 n	100000 n	7800 n
Calcium cyanide	592018	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Copper cyanide	544923	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Cyanazine	21725462	2.00E-03 h		8.40E-01 h			0.08 o	0.0075 o	0.0038 o	3.4 o	0.76 c
Cyanogen	460195	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Cyanogen bromide	506683	9.00E-02 i					3300 n	330 n	120 n	92000 n	7000 n
Cyanogen chloride	506774	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Free cyanide	57125	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Hydrogen cyanide	74908	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Potassium cyanide	151508	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Potassium silver cyanide	506616	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Silver cyanide	506649	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Sodium cyanide	143339	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Zinc cyanide	557211	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Cydohexanone	108941	5.00E+00 i				***	30000 n	18000 n	6800 n	1000000 n	390000 n
Cydohexlamine	108918	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Cyhalothrin/Karate	68085858	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Cypermethrin	52315078	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Cyromazine	66215278	7.50E-03 i					270 n	27 n	10 n	7700 n	590 n
Dacthal	1861321	5.00E-01 i					18000 n	1800 n	680 n	510000 n	39000 n
Dalapon	75990	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Danitol	39515418	5.00E-04 w					18 n	1.8 n	0.68 n	510 n	39 n
DDD	72548			2.40E-01 i			0.28 c	0.026 o	0.013 c	12 c	2.7 c
DDE	72559			3.40E-01 i			0.2 c	0.018 o	0.0093 c	8.4 c	1.9 c
DDT	50293	5.00E-04 i		3.40E-01 i	3.40E-01 i		0.2 c	0.018 o	0.0093 c	8.4 c	1.9 c
Decabromodiphenyl ether	1163195	1.00E-02 i				***	61 n	37 n	14 n	10000 n	780 n
Demeto	8065483	4.00E-05 i					1.5 n	0.15 n	0.054 n		3.1 n
Diallat	2303164			0E-02 h		***	0.17 c	0.1 o	0.052 c		10 c

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Diazinon	333415	9.00E-04 *h*					33 *n*	3.3 *n*	1.2 *n*	920 *n*	70 *n*
1,4-Dibromobenzene	106376	1.00E-02 *i*				***	61 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
Dibromochloromethane	124481	2.00E-02 *i*		8.40E-02 *i*		***	0.13 *c*	0.075 *o*	0.038 *o*	34 *c*	7.6 *c*
1,2-Dibromo-3-chloropropane	96128		5.71E-05 *i*	1.40E+00 *h*	6.90E-07 *h*	***	0.048 *c*	0.21 *n*	0.0023 *o*	2 *c*	0.46 *c*
1,2-Dibromoethane	106934		5.71E-05 *h*	8.50E+01 *i*	7.70E-01 *i*	***	0.00075 *c*	0.0081 *o*	0.000037 *o*	0.034 *c*	0.0075 *c*
Dibutyl phthalate	84742	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Dicamba	1918009	3.00E-02 *i*					1100 *n*	110 *n*	41 *n*	31000 *n*	2300 *n*
1,2-Dichlorobenzene	95501	9.00E-02 *i*	5.71E-02 *h*			***	370 *n*	210 *n*	120 *n*	92000 *n*	7000 *n*
1,3-Dichlorobenzene	541731	8.90E-02 *o*				***	540 *n*	320 *n*	120 *n*	91000 *n*	7000 *n*
1,4-Dichlorobenzene	106467		2.29E-01 *i*	2.40E-02 *h*		***	0.44 *c*	0.26 *c*	0.13 *c*	120 *c*	27 *c*
3,3'-Dichlorobenzidine	91941			4.50E-01 *i*			0.15 *c*	0.014 *o*	0.007 *o*	6.4 *o*	1.4 *c*
1,4-Dichloro-2-butene	764410				9.30E+00 *h*	***	0.0011 *c*	0.00067 *o*			
Dichlorodifluoromethane	75718	2.00E-01 *i*	5.71E-02 *h*			***	390 *n*	210 *n*	270 *n*	200000 *n*	16000 *n*
1,1-Dichloroethane	75343	1.00E-01 *h*	1.43E-01 *h*			***	810 *n*	520 *n*	140 *n*	100000 *n*	7800 *n*
1,2-Dichloroethane (EDC)	107062		2.86E-03 *e*	9.10E-02 *i*	9.10E-02 *i*	***	0.12 *c*	0.069 *o*	0.035 *o*	31 *o*	7 *c*
1,1-Dichloroethylene	75354	9.00E-03 *i*		6.00E-01 *i*	1.75E-01 *i*	***	0.044 *c*	0.036 *o*	0.0053 *o*	4.8 *o*	1.1 *c*
1,2-Dichloroethylene (cis)	156592	1.00E-02 *h*				***	61 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
1,2-Dichloroethylene (trans)	156605	2.00E-02 *i*				***	120 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
1,2-Dichloroethylene (mixture)	540590	9.00E-03 *h*				***	55 *n*	33 *n*	12 *n*	9200 *n*	700 *n*
2,4-Dichlorophenol	120832	3.00E-03 *i*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 *i*				***	61 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 *i*					290 *n*	29 *n*	11 *n*	8200 *n*	630 *n*
1,2-Dichloropropane	78875		1.14E-03 *i*	6.80E-02 *h*		***	0.16 *c*	0.092 *o*	0.046 *o*	42 *o*	9.4 *c*
2,3-Dichloropropanol	616239	3.00E-03 *i*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
1,3-Dichloropropene	542756	3.00E-04 *i*	5.71E-03 *i*	1.80E-01 *h*	1.30E-01 *h*	***	0.077 *o*	0.048 *o*	0.018 *o*	16 *o*	3.5 *c*
Dichlorvos	62737	5.00E-04 *i*		2.90E-01 *i*			0.23 *o*	0.022 *o*	0.011 *o*	9.9 *o*	2.2 *c*
Dicofol	115322			4.40E-01 *w*			0.15 *c*	0.014 *c*	0.0072 *c*	6.5 *o*	1.5 *c*
Dicyclopentadiene	77736	3.00E-02 *h*	5.71E-05 *h*			***	0.42 *n*	0.21 *n*	41 *n*	31000 *n*	2300 *n*
Dieldrin	60571	5.00E-05 *i*		1.60E+01 *i*	1.61E+01 *i*		0.0042 *c*	0.00039 *o*	0.0002 *c*	0.18 *c*	0.04 *c*
Diesel emissions			1.43E-03 *i*				52 *n*	5.2 *n*			
Diethyl phthalate	84662	8.00E-01 *i*					29000 *n*	2900 *n*	1100 *n*	820000 *n*	63000 *n*
Diethylene glycol, monobutyl ether	112345		5.71E-03 *h*				210 *n*	21 *n*			
Diethylene glycol, monoethyl ether	111900	2.00E+00 *h*					73000 *n*	7300 *n*	2700 *n*	1000000 *n*	160000 *n*
Diethylformamide	617845	1.10E-02 *h*					400 *n*	40 *n*	15 *n*	11000 *n*	860 *n*
Di(2-ethylhexyl)adipate	103231	6.00E-01 *i*		1.20E-03 *i*			56 *o*	5.2 *o*	2.6 *o*	2400 *o*	530 *c*
Diethylstilbestrol	56531			4.70E+03 *h*			0.000014 *c*	1.30E-06 *o*	6.70E-07 *o*	0.00061 *o*	0.00014 *c*
Difenzoquat (Avenge)	43222486	8.00E-02 *i*					2900 *n*	290 *n*	110 *n*	82000 *n*	6300 *n*
Diflubenzuron	35367385	2.00E-02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 *i*					2900 *n*	290 *n*	110 *n*	82000 *n*	6300 *n*
Dimethipin	55290647	2.00E-02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Dimethoate	60515	2.00E-04 *i*					7.3 *n*	0.73 *n*	0.27 *n*	200 *n*	16 *n*
3,3'-Dimethoxybenzidine	119904			1.40E-02 *h*			4.8 *c*	0.45 *o*	0.23 *o*	200 *o*	46 *c*

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Dimethyl phthalate	131113	1.00E+01 h					370000 n	37000 n	14000 n	1000000 n	780000 n
Dimethyl terephthalate	120616	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Dimethylamine	124403		5.71E-06 w				0.21 n	0.021 n			
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 h			0.12 c	0.011 c	0.0054 c	4.9 c	1.1 c
2,4-Dimethylaniline	95681			7.50E-01 h			0.09 c	0.0083 c	0.0042 c	3.8 c	0.85 c
N-N-Dimethylaniline	121697	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
3,3'-Dimethylbenzidine	119937			9.20E+00 h			0.0073 c	0.00068 c	0.00034 c	0.31 c	0.069 c
N,N-Dimethylformamide	68122	1.00E-01 h	8.57E-03 i				3700 n	31 n	140 n	100000 n	7800 n
1,1-Dimethylhydrazine	57147			2.60E+00 h	3.50E+00 h		0.026 c	0.0018 c	0.0012 c	1.1 c	0.25 c
1,2-Dimethylhydrazine	540738			3.70E+01 w	3.70E+01 w		0.0018 c	0.00017 c	0.000085 c	0.077 c	0.017 c
2,4-Dimethylphenol	105679	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
2,6-Dimethylphenol	576261	6.00E-04 i					22 n	2.2 n	0.81 n	610 n	47 n
3,4-Dimethylphenol	95658	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
1,2-Dinitrobenzene	528290	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
1,3-Dinitrobenzene	99650	1.00E-04 i					3.7 n	0.37 n	0.14 n	100 n	7.8 n
1,4-Dinitrobenzene	100254	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
4,6-Dinitro-o-cydohexyl phenol	131895	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
2,4-Dinitrophenol	51285	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Dinitrotoluene mixture				6.80E-01 i			0.099 c	0.0092 c	0.0046 c	4.2 c	0.94 c
2,4-Dinitrotoluene	121142	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
2,6-Dinitrotoluene	606202	1.00E-03 h					37 n	3.7 n	1.4 n	1000 n	78 n
Dinoseb	88857	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
di-n-Octyl phthalate	117840	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
1,4-Dioxane	123911			1.10E-02 i			6.1 c	0.57 c	0.29 c	260 c	58 c
Diphenamid	957517	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Diphenylamine	122394	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
1,2-Diphenylhydrazine	122667			8.00E-01 i	7.70E-01 i		0.084 c	0.0081 c	0.0039 c	3.6 c	0.8 c
Diquat	85007	2.20E-03 i					80 n	8 n	3 n	2200 n	170 n
Direct black 38	1937377			8.60E+00 h			0.0078 c	0.00073 c	0.00037 c	0.33 c	0.074 c
Direct blue 6	2602462			8.10E+00 h			0.0083 c	0.00077 c	0.00039 c	0.35 c	0.079 c
Direct brown 95	16071866			9.30E+00 h			0.0072 c	0.00067 c	0.00034 c	0.31 c	0.069 c
Disulfoton	298044	4.00E-05 i					1.5 n	0.15 n	0.054 n	41 n	3.1 n
1,4-Dithiane	505293	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Diuron	330541	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Dodine	2439103	4.00E-03 i					150 n	15 n	5.4 n	4100 n	310 n
Endosulfan	115297	6.00E-03 h					220 n	22 n	8.1 n	6100 n	470 n
Endothall	145733	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Endrin	72208	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Epichlorohydrin	106898	2.00E-03 h	2.86E-04 i	9.90E-03 i	4.20E-03 i		6.8 c	1 n	0.32 c	290 c	65 c
1,2-Epoxybutane	106887		5.71E-03 i				210 n	21 n			
Ethephr chloroethyl phosphonic acid)	16672870	5.00E-03 i					180 n	18 n	6.8 n		390 n
Ethion	563122	5.00E-04 i					18 n	1.8 n	0.68 n		39 n

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2-Ethoxyethanol acetate	111159	3.00E-01 *h*					11000 *n*	1100 *n*	410 *n*	310000 *n*	23000 *n*
2-Ethoxyethanol	110805	4.00E-01 *h*	5.71E-02 *I*				15000 *n*	210 *n*	540 *n*	410000 *n*	31000 *n*
Ethyl acrylate	140885			4.80E-02 *h*			1.4 *c*	0.13 *c*	0.066 *c*	60 *c*	13 *c*
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 *I*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Ethyl ether	60297	2.00E-01 *I*				***	1200 *n*	730 *n*	270 *n*	200000 *n*	16000 *n*
Ethyl methacrylate	97632	9.00E-02 *h*					3300 *n*	330 *n*	120 *n*	92000 *n*	7000 *n*
Ethyl acetate	141786	9.00E-01 *I*					33000 *n*	3300 *n*	1200 *n*	920000 *n*	70000 *n*
Ethylbenzene	100414	1.00E-01 *I*	2.86E-01 *I*			***	1300 *n*	1000 *n*	140 *n*	100000 *n*	7800 *n*
Ethylene cyanohydrin	109784	3.00E-01 *h*					11000 *n*	1100 *n*	410 *n*	310000 *n*	23000 *n*
Ethylene diamine	107153	2.00E-02 *h*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Ethylene glycol	107211	2.00E+00 *I*					73000 *n*	7300 *n*	2700 *n*	1000000 *n*	160000 *n*
Ethylene glycol, monobutyl ether	111762		5.71E-03 *h*				210 *n*	21 *n*			
Ethylene oxide	75218			1.02E+00 *h*	3.50E-01 *h*		0.066 *c*	0.018 *c*	0.0031 *c*	2.8 *c*	0.63 *c*
Ethylene thiourea (ETU)	96457	8.00E-05 *I*		6.00E-01 *h*			0.11 *c*	0.01 *c*	0.0053 *c*	4.8 *c*	1.1 *c*
Ethyl p-nitrophenyl phenylphosphorothioate	2104645	1.00E-05 *I*					0.37 *n*	0.037 *n*	0.014 *n*	10 *n*	0.78 *n*
Ethylnitrosourea	759739			1.40E+02 *w*			0.00048 *c*	0.000045 *c*	0.000023 *c*	0.02 *c*	0.0046 *c*
Ethylphthalyl ethyl glycolate	84720	3.00E+00 *I*					110000 *n*	11000 *n*	4100 *n*	1000000 *n*	230000 *n*
Express	10120	8.00E-03 *I*					290 *n*	29 *n*	11 *n*	8200 *n*	630 *n*
Fenamiphos	22224926	2.50E-04 *I*					9.1 *n*	0.91 *n*	0.34 *n*	260 *n*	20 *n*
Fluometuron	2164172	1.30E-02 *I*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Fluoride	7782414	6.00E-02 *I*					2200 *n*	220 *n*	81 *n*	61000 *n*	4700 *n*
Fluoridone	59756604	8.00E-02 *I*					2900 *n*	290 *n*	110 *n*	82000 *n*	6300 *n*
Flurprimidol	56425913	2.00E-02 *I*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Flutolanil	66332965	6.00E-02 *I*					2200 *n*	220 *n*	81 *n*	61000 *n*	4700 *n*
Fluvalinate	69409945	1.00E-02 *I*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
Folpet	133073	1.00E-01 *I*		3.50E-03 *I*			19 *c*	1.8 *c*	0.9 *c*	820 *c*	180 *c*
Fomesafen	72178020			1.90E-01 *I*			0.35 *c*	0.033 *c*	0.017 *c*	15 *c*	3.4 *c*
Fonofos	944229	2.00E-03 *I*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
Formaldehyde	50000	2.00E-01 *I*			4.55E-02 *I*		7300 *n*	0.14 *c*	270 *n*	200000 *n*	16000 *n*
Fornic Acid	64186	2.00E+00 *h*					73000 *n*	7300 *n*	2700 *n*	1000000 *n*	160000 *n*
Fosetyl-al	39148248	3.00E+00 *I*					110000 *n*	11000 *n*	4100 *n*	1000000 *n*	230000 *n*
Furan	110009	1.00E-03 *I*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Furazolidone	67458			3.80E+00 *h*			0.018 *c*	0.0016 *c*	0.00083 *c*	0.75 *c*	0.17 *c*
Furfural	98011	3.00E-03 *I*	1.43E-02 *h*				110 *n*	52 *n*	4.1 *n*	3100 *n*	230 *n*
Furium	531828			5.00E+01 *h*			0.0013 *c*	0.00013 *c*	0.000063 *c*	0.057 *c*	0.013 *c*
Furmecyclox	60568050			3.00E-02 *I*			2.2 *c*	0.21 *c*	0.11 *c*	95 *c*	21 *c*
Glufosinate-ammonium	77182822	4.00E-04 *I*					15 *n*	1.5 *n*	0.54 *n*	410 *n*	31 *n*
Glycidaldehyde	765344	4.00E-04 *I*	2.86E-04 *h*				15 *n*	1 *n*	0.54 *n*	410 *n*	31 *n*
Glyphosate	1071836	1.00E-01 *I*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Haloxyfop-methyl	69806402	5.00E-05 *I*					1.8 *n*	0.18 *n*	0.068 *n*	51 *n*	3.9 *n*
Harmony	79277273	1.30E-02 *I*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
HCH (alpha)	319846			6.30E+00 *I*	6.30E+00 *I*		0.011 *c*	0.00099 *c*	0.0005 *c*	0.45 *c*	0.1 *c*

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
HCH (beta)	319857			1.80E+00 i	1.80E+00 i		0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
HCH (gamma) Lindane	58899	3.00E-04 i		1.30E+00 h			0.052 c	0.0048 c	0.0024 c	2.2 c	0.49 c
HCH-technical	608731			1.80E+00 i	1.79E+00 i		0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
Heptachlor	76448	5.00E-04 i		4.50E+00 i	4.55E+00 i	***	0.0023 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Heptachlor epoxide	1024573	1.30E-05 i		9.10E+00 i	9.10E+00 i	***	0.0012 c	0.00069 c	0.00035 c	0.31 c	0.07 c
Hexabromobenzene	87821	2.00E-03 i				***	12 n	7.3 n	2.7 n	2000 n	160 n
Hexachlorobenzene	118741	8.00E-04 i		1.60E+00 i	1.61E+00 i	***	0.0066 c	0.0039 c	0.002 c	1.8 c	0.4 c
Hexachlorobutadiene	87683	2.00E-04 h		7.80E-02 i	7.70E-02 i	***	0.14 c	0.081 c	0.04 c	37 c	8.2 c
Hexachlorocyclopentadiene	77474	7.00E-03 i	2.00E-05 h			***	0.15 n	0.073 n	9.5 n	7200 n	550 n
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 i	4.55E+03 i		0.000011 c	1.40E-06 c	5.10E-07 c	0.00046 c	0.0001 c
Hexachloroethane	67721	1.00E-03 i		1.40E-02 i	1.40E-02 i	***	0.75 c	0.45 c	0.23 c	200 c	46 c
Hexachlorophene	70304	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 i		1.10E-01 i			0.61 c	0.057 c	0.029 c	26 c	5.8 c
n-Hexane	110543	6.00E-02 h	5.71E-02 i			***	350 n	210 n	81 n	61000 n	4700 n
Hexazinone	51235042	3.30E-02 i					1200 n	120 n	45 n	34000 n	2600 n
Hydrazine, hydrazine sulfate	302012			3.00E+00 i	1.71E+01 i		0.022 c	0.00037 c	0.0011 c	0.95 c	0.21 c
Hydrogen chloride	7647010		2.00E-03 i				73 n	7.3 n			
Hydrogen sulfide	7783064	3.00E-03 i	2.57E-04 i				110 n	0.94 n	4.1 n	3100 n	230 n
Hydroquinone	123319	4.00E-02 h					1500 n	150 n	54 n	41000 n	3100 n
Imazalil	35554440	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Imazaquin	81335377	2.50E-01 i					9100 n	910 n	340 n	260000 n	20000 n
Iprodione	36734197	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Isobutanol	78831	3.00E-01 i				***	1800 n	1100 n	410 n	310000 n	23000 n
Isophorone	78591	2.00E-01 i		9.50E-04 i			71 c	6.6 c	3.3 c	3000 c	670 c
Isopropalin	33820530	1.50E-02 i					550 n	55 n	20 n	15000 n	1200 n
Isopropyl methyl phosphonic acid	1832548	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Isoxaben	82558507	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Kepone	143500			1.80E+01 e			0.0037 c	0.00035 c	0.00018 c	0.16 c	0.035 c
Lactofen	77501634	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Lead (tetraethyl)	78002	1.00E-07 i					0.0037 n	0.00037 n	0.00014 n	0.1 n	0.0078 n
Linuron	330552	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Lithium	7439932	2.00E-02 e					730 n	73 n	27 n	20000 n	1600 n
Londax	83056996	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Malathion	121755	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Maleic anhydride	108316	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Maleic hydrazide	123331	5.00E-01 i					18000 n	1800 n	680 n	510000 n	39000 n
Malononitrile	109773	2.00E-05 h					0.73 n	0.073 n	0.027 n	20 n	1.6 n
Mancozeb	8018017	3.00E-02 h					1100 n	110 n	41 n	31000 n	2300 n
Maneb	12427382	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Manganese and compounds	7439965	5.00E-03 i	1.43e-05 i				180 n	0.052 n	6.8 n	5100 n	390 n
Mephos	950107	9.00E-05 h					3.3 n	0.33 n	0.12 n	-	7 n
Mepiq ide	24307264	3.00E-02 i					1100 n	110 n	41 n		2300 n

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Mercury (inorganic)	7439976	3.00E-04 *h*	8.57E-05 *h*				11 *n*	0.31 *n*	0.41 *n*	310 *n*	23 *n*
Mercury (methyl)	22967926	3.00E-04 *i*					11 *n*	1.1 *n*	0.41 *n*	310 *n*	23 *n*
Merphos	150505	3.00E-05 *i*					1.1 *n*	0.11 *n*	0.041 *n*	31 *n*	2.3 *n*
Merphos oxide	78488	3.00E-05 *i*					1.1 *n*	0.11 *n*	0.041 *n*	31 *n*	2.3 *n*
Metalaxyl	57837191	6.00E-02 *i*					2200 *n*	220 *n*	81 *n*	61000 *n*	4700 *n*
Methacrylonitrile	126987	1.00E-04 *i*	2.00E-04 *h*				3.7 *n*	0.73 *n*	0.14 *n*	100 *n*	7.8 *n*
Methamidophos	10265926	5.00E-05 *i*					1.8 *n*	0.18 *n*	0.068 *n*	51 *n*	3.9 *n*
Methanol	67561	5.00E-01 *i*					18000 *n*	1800 *n*	680 *n*	510000 *n*	39000 *n*
Methidathion	950378	1.00E-03 *i*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Methomyl	16752775	2.50E-02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Methoxychlor	72435	5.00E-03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
2-Methoxyethanol acetate	110496	2.00E-03 *h*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
2-Methoxyethanol	109864	1.00E-03 *h*	5.71E-03 *i*				37 *n*	21 *n*	1.4 *n*	1000 *n*	78 *n*
2-Methoxy-5-nitroaniline	99592			4.60E-02 *h*			1.5 *c*	0.14 *o*	0.069 *o*	62 *o*	14 *c*
Methyl acetate	79209	1.00E+00 *h*					37000 *n*	3700 *n*	1400 *n*	1000000 *n*	78000 *n*
Methyl acrylate	96333	3.00E-02 *h*					1100 *n*	110 *n*	41 *n*	31000 *n*	2300 *n*
2-Methylaniline hydrochloride	636215			1.80E-01 *h*			0.37 *o*	0.035 *o*	0.018 *o*	16 *o*	3.5 *c*
2-Methylaniline	95534			2.40E-01 *h*			0.28 *o*	0.026 *o*	0.013 *o*	12 *o*	2.7 *c*
Methyl chlorocarbonate	79221	1.00E+00 *w*					37000 *n*	3700 *n*	1400 *n*	1000000 *n*	78000 *n*
4-(2-Methyl-4-chlorophenoxy) butyric acid	94815	1.00E-02 *i*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
2-Methyl-4-chlorophenoxyacetic acid	94746	5.00E-04 *i*					18 *n*	1.8 *n*	0.68 *n*	510 *n*	39 *n*
2-(2-Methyl-14-chlorophenoxy)propionic acid	93652	1.00E-03 *i*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Methylcyclohexane	108872		8.57E-01 *h*				31000 *n*	3100 *n*			
Methylene bromide	74953	1.00E-02 *h*				***	61 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
Methylene chloride	75092	6.00E-02 *i*	8.57E-01 *h*	7.50E-03 *i*	1.64E-03 *i*	***	4.1 *c*	3.8 *o*	0.42 *o*	380 *o*	85 *c*
4,4'-Methylene bis(2-chloroaniline)	101144	7.00E-04 *h*		1.30E-01 *h*	1.30E-01 *h*		0.52 *c*	0.048 *o*	0.024 *o*	22 *o*	4.9 *c*
4,4'-Methylenebisbenzeneamine	101779			2.50E-01 *h*			0.27 *c*	0.025 *o*	0.013 *o*	11 *o*	2.6 *c*
4,4'-Methylene bis(N,N'-dimethyl)aniline	101611			4.60E-02 *i*			1.5 *c*	0.14 *o*	0.069 *o*	62 *o*	14 *c*
4,4'-Methylenediphenyl isocyanate	101688		5.71E-06 *h*			***	0.035 *n*	0.021 *n*			
Methyl ethyl ketone	78933	6.00E-01 *i*	2.86E-01 *i*				22000 *n*	1000 *n*	810 *n*	610000 *n*	47000 *n*
Methyl hydrazine	60344			1.10E+00 *h*			0.061 *c*	0.0057 *o*	0.0029 *o*	2.6 *o*	0.58 *c*
Methyl isobutyl ketone	108101	5.00E-02 *h*	2.29E-02 *h*				1800 *n*	84 *n*	68 *n*	51000 *n*	3900 *n*
Methyl methacrylate	80626	8.00E-02 *h*					2900 *n*	290 *n*	110 *n*	82000 *n*	6300 *n*
2-Methyl-5-nitroaniline	99558			3.30E-02 *h*			2 *o*	0.19 *o*	0.096 *o*	87 *o*	19 *c*
Methyl parathion	298000	2.50E-04 *i*					9.1 *n*	0.91 *n*	0.34 *n*	260 *n*	20 *n*
2-Methylphenol (o-cresol)	95487	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
3-Methylphenol (m-cresol)	103394	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
4-Methylphenol (p-cresol)	106445	5.00E-03 *h*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Methyl styrene (mixture)	25013154	6.00E-03 *h*	1.14E-02 *h*			***	60 *n*	42 *n*	8.1 *n*	6100 *n*	470 *n*
Methyl styrene (alpha)	98839	7.00E-02 *h*				***	430 *n*	260 *n*	95 *n*	72000 *n*	5500 *n*
Methyl tertbutyl ether (MTBE)	1634044	5.00E-03 *a*	8.57E-01 *i*			***	180 *n*	3100 *n*	6.8 *n*	5100 *n*	390 *n*
Metolachlor (Dual)	51218452	1.50E-01 *i*					5500 *n*	550 *n*	200 *n*	150000 *n*	12000 *n*

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Metribuzin	21807649	2.50E-02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Mirex	2385855	2.00E-04 *i*		1.80E+00 *h*			0.037 *c*	0.0035 *c*	0.0018 *c*	1.6 *c*	0.35 *c*
Molinate	2212671	2.00E-03 *i*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
Molybdenum	7439987	5.00E-03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Monochloramine	10599903	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Naled	300765	2.00E-03 *i*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
Napropamide	15299997	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Nickel refinery dust					8.40E-01 *i*			0.0075 *o*			
Nickel (soluble salts)	7440020	2.00E-02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Nickel subsulfide	12035722				1.70E+00 *i*			0.0037 *o*			
Nitrapyrin	1929824	1.50E-03 *w*					55 *n*	5.5 *n*	2 *n*	1500 *n*	120 *n*
Nitrate	14797558	1.60E+00 *i*					58000 *n*	5800 *n*	2200 *n*	1000000 *n*	130000 *n*
Nitric Oxide	10102439	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
Nitrite	14797650	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
2-Nitroaniline	88744	6.00E-05 *w*	5.71E-05 *h*				2.2 *n*	0.21 *n*	0.081 *n*	61 *n*	4.7 *n*
3-Nitroaniline	99092	3.00E-03 *o*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
4-Nitroaniline	100016	3.00E-03 *o*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
Nitrobenzene	98953	5.00E-04 *i*	5.71E-04 *h*			***	3.4 *n*	2.1 *n*	0.68 *n*	510 *n*	39 *n*
Nitrofurantoin	67209	7.00E-02 *h*					2600 *n*	260 *n*	95 *n*	72000 *n*	5500 *n*
Nitrofurazone	59870			1.50E+00 *h*	9.40E+00 *h*		0.045 *c*	0.00067 *c*	0.0021 *c*	1.9 *c*	0.43 *c*
Nitrogen dioxide	10102440	1.00E+00 *i*					37000 *n*	3700 *n*	1400 *n*	1000000 *n*	78000 *n*
Nitroguanidine	556887	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
4-Nitrophenol	100027	6.20E-02 *o*					2300 *n*	230 *n*	84 *n*	63000 *n*	4800 *n*
2-Nitropropane	79469		5.71E-03 *i*		9.40E+00 *h*		210 *n*	0.00067 *c*			
N-Nitrosodi-n-butylamine	924163			5.40E+00 *i*	5.60E+00 *i*		0.012 *c*	0.0011 *c*	0.00058 *c*	0.53 *c*	0.12 *c*
N-Nitrosodiethanolamine	1116547			2.80E+00 *i*			0.024 *c*	0.0022 *c*	0.0011 *c*	1 *c*	0.23 *c*
N-Nitrosodiethylamine	55185			1.50E+02 *i*	1.51E+02 *i*		0.00045 *c*	0.000041 *c*	0.000021 *c*	0.019 *c*	0.0043 *c*
N-Nitrosodimethylamine	62759			5.10E+01 *i*	4.90E+01 *i*		0.0013 *c*	0.00013 *c*	0.000062 *c*	0.056 *c*	0.013 *c*
N-Nitrosodiphenylamine	86306			4.90E-03 *i*			14 *c*	1.3 *c*	0.64 *c*	580 *c*	130 *c*
N-Nitroso di-n-propylamine	621647			7.00E+00 *i*			0.0096 *c*	0.00089 *c*	0.00045 *c*	0.41 *c*	0.091 *c*
N-Nitroso-N-methylethylamine	10595956			2.20E+01 *i*			0.0031 *c*	0.00028 *c*	0.00014 *c*	0.13 *c*	0.029 *c*
N-Nitrosopyrrolidine	930552			2.10E+00 *i*	2.13E+00 *i*		0.032 *c*	0.0029 *c*	0.0015 *c*	1.4 *c*	0.3 *c*
m-Nitrotoluene	99081	1.00E-02 *h*				***	61 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
o-Nitrotoluene	88722	1.00E-02 *h*				***	61 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
p-Nitrotoluene	99990	1.00E-02 *h*				***	61 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
Norflurazon	27314132	4.00E-02 *i*					1500 *n*	150 *n*	54 *n*	41000 *n*	3100 *n*
NuStar	85509199	7.00E-04 *i*					26 *n*	2.6 *n*	0.95 *n*	720 *n*	55 *n*
Octabromodiphenyl ether	32536520	3.00E-03 *i*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
Octahydro-1357-tetranitro-1357-tetrazocine	2691410	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Octamethylpyrophosphoramide	152169	2.00E-03 *h*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
Oryzalin	19044883	5.00E-02 *i*					1800 *n*	180 *n*	68 *n*		3900 *n*
Oxadia:	19666309	5.00E-03 *i*					180 *n*	18 *n*	6.8 *n*		390 *n*

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Oxamyl	23135220	2.50E–02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Oxyfluorfen	42874033	3.00E–03 *i*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
Paclobutrazol	76738620	1.30E–02 *i*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Paraquat	1910425	4.50E–03 *i*					160 *n*	16 *n*	6.1 *n*	4600 *n*	350 *n*
Parathion	56382	6.00E–03 *h*					220 *n*	22 *n*	8.1 *n*	6100 *n*	470 *n*
Pebulate	1114712	5.00E–02 *h*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Pendimethalin	40487421	4.00E–02 *i*					1500 *n*	150 *n*	54 *n*	41000 *n*	3100 *n*
Pentabromo–6–chloro cyclohexane	87843			2.30E–02 *h*			2.9 *c*	0.27 *c*	0.14 *c*	120 *c*	23 *c*
Pentabromodiphenyl ether	32534819	2.00E–03 *i*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
Pentachlorobenzene	608935	8.00E–04 *i*				***	4.9 *n*	2.9 *n*	1.1 *n*	820 *n*	63 *n*
Pentachloronitrobenzene	82688	3.00E–03 *i*		2.60E–01 *h*		***	0.041 *c*	0.024 *c*	0.012 *c*	11 *c*	2.5 *c*
Pentachlorophenol	87865	3.00E–02 *i*		1.20E–01 *i*			0.56 *c*	0.052 *c*	0.026 *c*	24 *c*	5.3 *c*
Permethrin	52645531	5.00E–02 *i*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Phenmedipham	13684634	2.50E–01 *i*					9100 *n*	910 *n*	340 *n*	260000 *n*	20000 *n*
Phenol	108952	6.00E–01 *i*					22000 *n*	2200 *n*	810 *n*	610000 *n*	47000 *n*
m–Phenylenediamine	108452	6.00E–03 *i*					220 *n*	22 *n*	8.1 *n*	6100 *n*	470 *n*
o–Phenylenediamine	95545	6.00E–03 *h*					220 *n*	22 *n*	8.1 *n*	6100 *n*	470 *n*
p–Phenylenediamine	106503	1.90E–01 *h*					6900 *n*	690 *n*	260 *n*	190000 *n*	15000 *n*
Phenylmercuric acetate	62384	8.00E–05 *i*					2.9 *n*	0.29 *n*	0.11 *n*	82 *n*	6.3 *n*
2–Phenylphenol	90437			1.94E–03 *h*			35 *c*	3.2 *c*	1.6 *c*	1500 *c*	330 *c*
Phorate	298022	2.00E–04 *h*					7.3 *n*	0.73 *n*	0.27 *n*	200 *n*	16 *n*
Phosmet	732116	2.00E–02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Phosphine	7803512	3.00E–04 *i*	8.57E–06 *h*				11 *n*	0.031 *n*	0.41 *n*	310 *n*	23 *n*
Phosphorus (white)	7723140	2.00E–05 *i*					0.73 *n*	0.073 *n*	0.027 *n*	20 *n*	1.6 *n*
p–Phthalic acid	100210	1.00E+00 *h*					37000 *n*	3700 *n*	1400 *n*	1000000 *n*	78000 *n*
Phthalic anhydride	85449	2.00E+00 *i*	3.43E–01 *h*				73000 *n*	1300 *n*	2700 *n*	1000000 *n*	160000 *n*
Picloram	1918021	7.00E–02 *i*					2600 *n*	260 *n*	95 *n*	72000 *n*	5500 *n*
Pirimiphos–methyl	29232937	1.00E–02 *i*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
Polybrominated biphenyls		7.00E–06 *h*		8.90E+00 *h*			0.0076 *c*	0.0007 *c*	0.00035 *c*	0.32 *c*	0.072 *c*
Polychlorinated biphenyls (PCBs)	1336363			7.70E+00 *i*			0.0087 *c*	0.00081 *c*	0.00041 *c*	0.37 *c*	0.083 *c*
Arodor 1016	12674112	7.00E–05 *i*					2.6 *n*	0.26 *n*	0.095 *n*	72 *n*	5.5 *n*
Polychlorinated terphenyls (PCTs)				4.50E+00 *e*			0.015 *c*	0.0014 *c*	0.0007 *c*	0.64 *c*	0.14 *c*
Polynuclear aromatic hydrocarbons											
Acenaphthene	83329	6.00E–02 *i*					2200 *n*	220 *n*	81 *n*	61000 *n*	4700 *n*
Anthracene	120127	3.00E–01 *i*					11000 *n*	1100 *n*	410 *n*	310000 *n*	23000 *n*
Benzo[a]pyrene	50328			7.30E+00 *i*	6.10E+00 *h*		0.0092 *c*	0.001 *c*	0.00043 *c*	0.39 *c*	0.088 *c*
Benzo[b]fluoranthene	205992			7.30E–01 *e*	6.10E–01 *e*		0.092 *c*	0.01 *c*	0.0043 *c*	3.9 *c*	0.88 *c*
Benzo[k]fluoranthene	207089			7.30E–02 *e*	6.10E–02 *e*		0.92 *c*	0.1 *c*	0.043 *c*	39 *c*	8.8 *c*
Benz[a]anthracene	56553			7.30E–01 *e*	6.10E–01 *e*		0.092 *c*	0.01 *c*	0.0043 *c*	3.9 *c*	0.88 *c*
Chrysene	218019			7.30E–03 *e*	6.10E–03 *e*		9.2 *c*	1 *c*	0.43 *c*	390 *c*	88 *c*
Dibenz[ah]anthracene	53703			7.30E+00 *e*	6.10E+00 *e*		0.0092 *c*	0.001 *c*	0.00043 *c*	0.39 *c*	0.088 *c*
Fluoranthene	206440	4.00E–02 *i*					1500 *n*	150 *n*	54 *n*	41000 *n*	3100 *n*

Sources: i=IRIS h=HEAST a=HEAST alt. x=W/D from IRIS y=W/D from HEAST e=EPA–ECAO o=Other EPA docs. *Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Fluorene	86737	4.00E–02 *i*					1500 *n*	150 *n*	54 *n*	41000 *n*	3100 *n*
Indeno[1,2,3–cd]pyrene	193395			7.30E–01 *e*	6.10E–01 *e*		0.092 *c*	0.01 *c*	0.0043 *c*	3.9 *c*	0.88 *c*
Naphthalene	91203	4.00E–02 *w*					1500 *n*	150 *n*	54 *n*	41000 *n*	3100 *n*
Pyrene	129000	3.00E–02 *i*					1100 *n*	110 *n*	41 *n*	31000 *n*	2300 *n*
Prochloraz	67747095	9.00E–03 *i*		1.50E–01 *i*			0.45 *c*	0.042 *c*	0.021 *c*	19 *c*	4.3 *c*
Profluralin	26399360	6.00E–03 *h*					220 *n*	22 *n*	8.1 *n*	6100 *n*	470 *n*
Prometon	1610180	1.50E–02 *i*					550 *n*	55 *n*	20 *n*	15000 *n*	1200 *n*
Prometryn	7287196	4.00E–03 *i*					150 *n*	15 *n*	5.4 *n*	4100 *n*	310 *n*
Pronamide	23950585	7.50E–02 *i*					2700 *n*	270 *n*	100 *n*	77000 *n*	5900 *n*
Propachlor	1918167	1.30E–02 *i*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Propanil	709988	5.00E–03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Propargite	2312358	2.00E–02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Propargyl alcohol	107197	2.00E–03 *i*					73 *n*	7.3 *n*	2.7 *n*	2000 *n*	160 *n*
Propazine	139402	2.00E–02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Propham	122429	2.00E–02 *i*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Propiconazole	60207901	1.30E–02 *i*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Propylene glycol	57556	2.00E+01 *h*					730000 *n*	73000 *n*	27000 *n*	1000000 *n*	1000000 *n*
Propylene glycol, monoethyl ether	52125538	7.00E–01 *h*					26000 *n*	2600 *n*	950 *n*	720000 *n*	55000 *n*
Propylene glycol, monomethyl ether	107982	7.00E–01 *h*	5.71E–01 *i*				26000 *n*	2100 *n*	950 *n*	720000 *n*	55000 *n*
Propylene oxide	75569		8.57E–03 *i*	2.40E–01 *i*	1.29E–02 *i*		0.28 *c*	0.49 *c*	0.013 *c*	12 *c*	2.7 *c*
Pursuit	81335775	2.50E–01 *i*					9100 *n*	910 *n*	340 *n*	260000 *n*	20000 *n*
Pydrin	51630581	2.50E–02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Pyridine	110861	1.00E–03 *i*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Quinalphos	13593038	5.00E–04 *i*					18 *n*	1.8 *n*	0.68 *n*	510 *n*	39 *n*
Quinoline	91225			1.20E+01 *h*			0.0056 *c*	0.00052 *c*	0.00026 *c*	0.24 *c*	0.053 *c*
Resmethrin	10453868	3.00E–02 *i*					1100 *n*	110 *n*	41 *n*	31000 *n*	2300 *n*
Ronnel	299843	5.00E–02 *h*					1800 *n*	180 *n*	68 *n*	51000 *n*	3900 *n*
Rotenone	83794	4.00E–03 *i*					150 *n*	15 *n*	5.4 *n*	4100 *n*	310 *n*
Savey	78587050	2.50E–02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Selenious Acid	778[illegible]8	5.00E–03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Selenium	7782492	5.00E–03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Selenourea	630104	5.00E–03 *h*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Sethoxydim	74051802	9.00E–02 *i*					3300 *n*	330 *n*	120 *n*	92000 *n*	7000 *n*
Silver and compounds	7440224	5.00E–03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Simazine	122349	5.00E–03 *i*		1.20E–01 *h*			0.56 *c*	0.052 *c*	0.026 *c*	24 *c*	5.3 *c*
Sodium azide	26628228	4.00E–03 *i*					150 *n*	15 *n*	5.4 *n*	4100 *n*	310 *n*
Sodium diethyldithiocarbamate	148185	3.00E–02 *i*		2.70E–01 *h*			0.25 *c*	0.023 *c*	0.012 *c*	11 *c*	2.4 *c*
Sodium fluoroacetate	62748	2.00E–05 *i*					0.73 *n*	0.073 *n*	0.027 *n*	20 *n*	1.6 *n*
Sodium metavanadate	13718268	1.00E–03 *h*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Strontium, stable	7440246	6.00E–01 *i*					22000 *n*	2200 *n*	810 *n*	610000 *n*	47000 *n*
Strychni	57249	3.00E–04 *i*					11 *n*	1.1 *n*	0.41 *n*		23 *n*
Styrene	100425	2.00E–01 *i*	2.86E–0[illegible]			***	1600 *n*	1000 *n*	270 *n*		16000 *n*

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Systhane	88671890	2.50E-02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
2,3,7,8-TCDD (dioxin)	1746016			1.50E+05 *h*	1.50E+05 *h*		4.50E-07 *c*	4.20E-08 *c*	2.10E-08 *c*	0.000019 *c*	4.30E-06 *c*
Tebuthiuron	34014181	7.00E-02 *i*					2600 *n*	260 *n*	95 *n*	72000 *n*	5500 *n*
Temephos	3383968	2.00E-02 *h*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Terbacil	5902512	1.30E-02 *i*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Terbufos	13071799	2.50E-05 *h*					0.91 *n*	0.091 *n*	0.034 *n*	26 *n*	2 *n*
Terbutryn	886500	1.00E-03 *i*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
1,2,4,5-Tetrachlorobenzene	95943	3.00E-04 *i*				***	1.8 *n*	1.1 *n*	0.41 *n*	310 *n*	23 *n*
1,1,1,2-Tetrachloroethane	630206	3.00E-02 *i*		2.60E-02 *i*	2.59E-02 *i*	***	0.41 *c*	0.24 *c*	0.12 *c*	110 *c*	25 *c*
1,1,2,2-Tetrachloroethane	630206			2.00E-01 *i*	2.03E-01 *i*	***	0.052 *c*	0.031 *c*	0.016 *c*	14 *c*	3.2 *c*
Tetrachloroethylene (PCE)	127184	1.00E-02 *i*		5.20E-02 *e*	2.03E-03 *e*	***	1.1 *c*	3.1 *c*	0.061 *c*	55 *c*	12 *c*
2,3,4,6-Tetrachlorophenol	58902	3.00E-02 *i*					1100 *n*	110 *n*	41 *n*	31000 *n*	2300 *n*
p,a,a,a-Tetrachlorotoluene	5216251			2.00E+01 *h*		***	0.00053 *c*	0.00031 *c*	0.00016 *c*	0.14 *c*	0.032 *c*
Tetrachlorovinphos	961115	3.00E-02 *i*		2.40E-02 *h*			2.8 *c*	0.26 *c*	0.13 *c*	120 *c*	27 *c*
Tetraethyldithiopyrophosphate	3689245	5.00E-04 *i*					18 *n*	1.8 *n*	0.68 *n*	510 *n*	39 *n*
Thallic oxide	1314325	7.00E-05 *h*					2.6 *n*	0.26 *n*	0.095 *n*	72 *n*	5.5 *n*
Thallium											
Thallium acetate	563688	9.00E-05 *i*					3.3 *n*	0.33 *n*	0.12 *n*	92 *n*	7 *n*
Thallium carbonate	6533739	8.00E-05 *i*					2.9 *n*	0.29 *n*	0.11 *n*	82 *n*	6.3 *n*
Thallium chloride	7791120	8.00E-05 *i*					2.9 *n*	0.29 *n*	0.11 *n*	82 *n*	6.3 *n*
Thallium nitrate	10102451	9.00E-05 *i*					3.3 *n*	0.33 *n*	0.12 *n*	92 *n*	7 *n*
Thallium selenite	12039520	9.00E-05 *w*					3.3 *n*	0.33 *n*	0.12 *n*	92 *n*	7 *n*
Thallium sulfate	7446186	8.00E-05 *i*					2.9 *n*	0.29 *n*	0.11 *n*	82 *n*	6.3 *n*
Thiobencarb	28249776	1.00E-02 *i*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
2-(Thiocyanomethylthio)-benzothiazole	21564170	3.00E-02 *h*					1100 *n*	110 *n*	41 *n*	31000 *n*	2300 *n*
Thiofanox	39196184	3.00E-04 *h*					11 *n*	1.1 *n*	0.41 *n*	310 *n*	23 *n*
Thiophanate-methyl	23564058	8.00E-02 *i*					2900 *n*	290 *n*	110 *n*	82000 *n*	6300 *n*
Thiram	137268	5.00E-03 *i*					180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Tin and compounds		6.00E-01 *h*					22000 *n*	2200 *n*	810 *n*	610000 *n*	47000 *n*
Toluene	108883	2.00E-01 *i*	1.14E-01 *w*			***	750 *n*	420 *n*	270 *n*	200000 *n*	16000 *n*
Toluene-2,4-diamine	95807			3.20E+00 *h*			0.021 *c*	0.002 *c*	0.00099 *c*	0.89 *c*	0.2 *c*
Toluene-2,5-diamine	95705	6.00E-01 *h*					22000 *n*	2200 *n*	810 *n*	610000 *n*	47000 *n*
Toluene-2,6-diamine	823405	2.00E-01 *h*					7300 *n*	730 *n*	270 *n*	200000 *n*	16000 *n*
p-Toluidine	106490			1.90E-01 *h*			0.35 *c*	0.033 *c*	0.017 *c*	15 *c*	3.4 *c*
Toxaphene	8001352			1.10E+00 *i*	1.12E+00 *i*		0.061 *c*	0.0056 *c*	0.0029 *c*	2.6 *c*	0.58 *c*
Tralomethrin	66841256	7.50E-03 *i*					270 *n*	27 *n*	10 *n*	7700 *n*	590 *n*
Triallate	2303175	1.30E-02 *i*					470 *n*	47 *n*	18 *n*	13000 *n*	1000 *n*
Triasulfuron	82097505	1.00E-02 *i*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
1,2,4-Tribromobenzene	615543	5.00E-03 *i*				***	30 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
Tributyltin oxide (TBTO)	56359	3.00E-05 *i*					1.1 *n*	0.11 *n*	0.041 *n*	31 *n*	2.3 *n*
2,4,6-Trichloroaniline hydrochloride	33663502			2.90E-02 *h*			2.3 *c*	0.22 *c*	0.11 *c*	99 *c*	22 *c*
2,4,6-Trichloroaniline	634935			3.40E-02 *h*			2 *c*	0.18 *c*	0.093 *c*	84 *c*	19 *c*

EPA Region III Risk-Based Concentrations: R.L. Smith (07-Jan-94)

Sources: I=IRIS h=HEAST a=HEAST alt. x=W/D from IRIS y=W/D from HEAST e=EPA-ECAO o=Other EPA docs. *Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
1,2,4-Trichlorobenzene	120821	1.00E-02 *i*	2.57E-03 *h*			***	18 *n*	9.4 *n*	14 *n*	10000 *n*	780 *n*
1,1,1-Trichloroethane	71556	9.00E-02 *w*	2.86E-01 *w*			***	1300 *n*	1000 *n*	120 *n*	92000 *n*	7000 *n*
1,1,2-Trichloroethane	79005	4.00E-03 *i*		5.70E-02 *i*	5.60E-02 *i*	***	0.19 *c*	0.11 *c*	0.055 *c*	50 *c*	11 *c*
Trichloroethylene (TCE)	79016	6.00E-03 *e*		1.10E-02 *w*	6.00E-03 *e*	***	1.6 *c*	1 *c*	0.29 *c*	260 *c*	58 *c*
Trichlorofluoromethane	75694	3.00E-01 *i*	2.00E-01 *h*			***	1300 *n*	730 *n*	410 *n*	310000 *n*	23000 *n*
2,4,5-Trichlorophenol	95954	1.00E-01 *i*					3700 *n*	370 *n*	140 *n*	100000 *n*	7800 *n*
2,4,6-Trichlorophenol	88062			1.10E-02 *i*	1.09E-02 *i*		6.1 *c*	0.57 *c*	0.29 *c*	260 *c*	58 *c*
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 *i*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 *i*					290 *n*	29 *n*	11 *n*	8200 *n*	630 *n*
1,1,2-Trichloropropane	598776	5.00E-03 *i*				***	30 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
1,2,3-Trichloropropane	96184	6.00E-03 *i*				***	37 *n*	22 *n*	8.1 *n*	6100 *n*	470 *n*
1,2,3-TCP as carcinogen	96184			2.70E+00 *e*		***	0.0039 *c*	0.0023 *c*	0.0012 *c*	1.1 *c*	0.24 *c*
1,2,3-Trichloropropene	96195	5.00E-03 *h*				***	30 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*
1,1,2-Trichloro-1,2,2- trifluoroethane	76131	3.00E+01 *i*	8.57E+00 *h*			***	59000 *n*	31000 *n*	41000 *n*	1000000 *n*	1000000 *n*
Tridiphane	58138082	3.00E-03 *i*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
Triethyl amine	121448		2.00E-03 *i*				73 *n*	7.3 *n*			
Trifluralin	1582098	7.50E-03 *i*		7.70E-03 *i*			8.7 *c*	0.81 *c*	0.41 *c*	370 *c*	83 *c*
Trimethyl phosphate	512561			3.70E-02 *h*			1.8 *c*	0.17 *c*	0.085 *c*	77 *c*	17 *c*
1,2,4-Trimethylbenzene	95636	5.00e-04 *e*				***	3 *n*	1.8 *n*	0.68 *n*	510 *n*	39 *n*
1,3,5-Trimethylbenzene	108678	4.00e-04 *e*				***	2.4 *n*	1.5 *n*	0.54 *n*	410 *n*	31 *n*
1,3,5-Trinitrobenzene	99354	5.00E-05 *i*					1.8 *n*	0.18 *n*	0.068 *n*	51 *n*	3.9 *n*
Trinitrophenylmethylnitramine	479458	1.00E-02 *h*					370 *n*	37 *n*	14 *n*	10000 *n*	780 *n*
2,4,6-Trinitrotoluene	118967	5.00E-04 *i*		3.00E-02 *i*			2.2 *c*	0.21 *c*	0.11 *c*	95 *c*	21 *c*
Uranium (soluble salts)	7440611	3.00E-03 *i*					110 *n*	11 *n*	4.1 *n*	3100 *n*	230 *n*
Vanadium	7440622	7.00E-03 *h*					260 *n*	26 *n*	9.5 *n*	7200 *n*	550 *n*
Vanadium pentoxide	1314621	9.00E-03 *i*					330 *n*	33 *n*	12 *n*	9200 *n*	700 *n*
Vanadium sulfate	36907423	2.00E-02 *h*					730 *n*	73 *n*	27 *n*	20000 *n*	1600 *n*
Vernam	1929777	1.00E-03 *i*					37 *n*	3.7 *n*	1.4 *n*	1000 *n*	78 *n*
Vindozolin	50471448	2.50E-02 *i*					910 *n*	91 *n*	34 *n*	26000 *n*	2000 *n*
Vinyl acetate	108054	1.00E+00 *h*	5.71E-02 *i*				37000 *n*	210 *n*	1400 *n*	1000000 *n*	78000 *n*
Vinyl bromide	593602		8.57E-04 *i*			***	5.2 *n*	3.1 *n*			
Vinyl chloride	75014			1.90E+00 *h*	3.00E-01 *h*	***	0.019 *c*	0.021 *c*	0.0017 *c*	1.5 *c*	0.34 *c*
Warfarin	81812	3.00E-04 *i*					11 *n*	1.1 *n*	0.41 *n*	310 *n*	23 *n*
m-Xylene	108323	2.00E+00 *h*	2.00E-01 *w*			***	1400 *n*	730 *n*	2700 *n*	1000000 *n*	160000 *n*
o-Xylene	95476	2.00E+00 *h*	2.00E-01 *w*			***	1400 *n*	730 *n*	2700 *n*	1000000 *n*	160000 *n*
p-Xylene	106423		8.57E-02 *w*			***	520 *n*	310 *n*			

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch St
Philadelphia, Pennsylvania 19103

SUBJECT: Risk-Based Concentration Table **DATE:** 4/12/1999

FROM: Jennifer Hubbard, Toxicologist
Superfund Technical Support Section (3HS41)

TO: RBC Table Users

Attached is the EPA Region III Risk-Based Concentration (RBC) Table, which we prepare and post periodically for all interested parties.

IMPORTANT NOTES: To make the RBC Table more accessible and to minimize paper usage, it is now primarily available through the Internet. The address is **http://www.epa.gov/reg3hwmd/risk/riskmenu.htm**. The Table is available in both Lotus and Excel as "self-extracting" files. These files should be downloaded and then processed with your computer's "run" function. The files can then be viewed in Lotus or Excel. If you have technical questions about the toxicological or risk assessment aspects of the RBCs, please contact Jennifer Hubbard at 215-814-3328 or hubbard.jennifer@epamail.epa.gov. Other questions can be addressed to Vanessa Sizer or Terri Fields at 215-814-3041. You can also consult the Frequently Asked Questions, below.

CONTENTS, USES, AND LIMITATIONS OF THE RBC TABLE

The RBC Table contains Reference Doses (RfDs) and Cancer Slope Factors (CSFs) for 400-500 chemicals. These toxicity factors have been combined with "standard" exposure scenarios to calculate RBCs--chemical concentrations corresponding to fixed levels of risk (i.e., a Hazard Quotient (HQ) of 1, or lifetime cancer risk of 1E-6, whichever occurs at a lower concentration) in water, air, fish tissue, and soil.

The Region III toxicologists use RBCs to screen sites not yet on the NPL, respond rapidly to citizen inquiries, and spot-check formal baseline risk assessments. The primary use of RBCs is for chemical screening during baseline risk assessment (see EPA Regional Guidance EPA/903/R-93-001, "Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening"). The exposure equations come from EPA's Risk Assessment Guidance for Superfund (RAGS), while the exposure factors are those recommended in RAGS or supplemental guidance from the Superfund program. The attached technical background

document provides specific equations and assumptions. Simply put, RBCs are like risk assessments run in reverse. For a single contaminant in a single medium, under standard default exposure assumptions, the RBC corresponds to the target risk or hazard quotient.

RBCs also have several important limitations. Specifically excluded from consideration are (1) transfers from soil to air and groundwater, 2) cumulative risk from multiple contaminants or media, and (3) dermal risk. Additionally, the risks for inhalation of vapors from water are based on a very simple model, whereas detailed risk assessments may use more detailed showering models. Also, the toxicity information in the Table has been assembled by hand and (despite extensive checking and years of use) may contain errors. It's advisable to cross-check before relying on any RfDs or CSFs in the Table. If you note any errors, please let us know.

It is important to note that this Table uses inhalation RfDs and CSFs rather than RfCs and inhalation unit cancer risks. This is because the latter factors incorporate exposure assumptions and therefore can only be used for one exposure scenario. Because risk assessors need to evaluate risks for many types of scenarios, the factors have been converted to the more traditional RfDs and CSFs. Unless otherwise indicated in the toxicity-factor source, the assumption is that RfCs and unit risks should be adjusted by a 70-kilogram body weight and a 20 m^3/day inhalation rate to generate the RfDs and CSFs.

Many users want to know if the RBCs can be used as valid no-action levels or cleanup levels, especially for soils. The answer is a bit complex. First, it is important to realize that the RBC Table does not constitute regulation or guidance, and should not be viewed as a substitute for a site-specific risk assessment. For sites where:

1. A single medium is contaminated;

2. A single contaminant contributes nearly all the health risk;

3. Volatilization, leaching, dermal contact, and other pathways not included in the RBCs are not expected to be significant;

4. The exposure scenarios and assumptions used in the RBC table are appropriate for the site;

5. The fixed risk levels used in the RBC table are appropriate for the site; and

6. Risk to ecological receptors is not expected to be significant;

the RBCs would probably be protective as no-action levels or cleanup goals. However, to the extent that a site deviates from this description, as most do, the RBCs would not necessarily be appropriate.

To summarize, the Table should generally not be used to set cleanup or no-action levels

at CERCLA sites or RCRA Corrective Action sites, to substitute for EPA guidance for preparing baseline risk assessments, or to determine if a waste is hazardous under RCRA.

SPECIAL NOTES

The RBC Table was originally developed by Roy L. Smith, Ph.D., for use by risk assessors in the Region III Superfund program. Dr. Smith is no longer with Region III, and the Table continues to evolve. You may notice some modifications of formatting and conventions used in the Table.

For instance, besides formatting, the following changes are noteworthy:

- As usual, updated toxicity factors have been used wherever available. However, because IRIS and provisional values are updated more frequently than the RBC Table, RBC Table users are ultimately responsible for obtaining the most up-to-date values. The RBC Table is provided as a convenience, but toxicity factors are compiled from the original sources and it is those original sources that should serve as the definitive reference.

- Certain outdated and withdrawn numbers have been removed from the Table.

- Changes to the table have been marked with asterisks (**). Changes may involve a corrected CAS number or a correction in the VOC status, or they may reflect changes of RfDs and CSFs on IRIS.

- RBCs are no longer rounded to 1E6 ppm. For certain low-toxicity chemicals, the RBCs exceed possible concentrations at the target risks. In such cases, Dr. Smith rounded these numbers to the highest possible concentration, or 1E6 ppm. The rounding has been discontinued so that Table users can adjust the RBCs to a different target risk whenever necessary. For example, when screening chemicals at a target HQ of 0.1, noncarcinogenic RBCs may simply be divided by 10. Such scaling is not possible when RBCs are rounded.

- This Table was originally compiled to assist Superfund risk assessors in screening hazardous waste sites. The large number of chemicals made the Table unwieldy and difficult to keep current. Many of the chemicals did not typically (or even occasionally) appear at Superfund sites. Starting with the April 1998 version of the Table, the 600+ chemicals were reduced to some 400-500 chemicals by eliminating many of those atypical chemicals. Through time, the Table may continue to grow or decrease in size. Comments on this issue are appreciated. During the last six months, only one request was received for restoration of a chemical: NuStar has been restored to the Table. (A list of the deleted chemicals is attached.)

- At Region III Superfund sites, noncancer RBCs are typically adjusted downward to correspond to a target HQ of 0.1 rather than 1. (This is done to ensure that chemicals with

additive effects are not prematurely eliminated during screening.) However, some chemicals have RBCs at HQs of 0.1 that are lower than their RBCs at 1E-6 cancer risk. In other words, the screening RBC would change from carcinogenic to noncarcinogenic. A new feature of this Table is that these chemicals are now flagged with a "!" symbol. Therefore, assessors screening with adjusted RBCs will be alerted to this situation.

- Earlier versions of this Table included a substitution of inhalation toxicity factors for oral factors whenever oral factors were unavailable (this applied only to groundwater and air, but not soil or fish). This practice has been discontinued in order to minimize the uncertainty associated with such a conversion. The discontinuation of this practice does not significantly decrease the number of available RBCs.

- The criterion for "VOC status" has been adjusted in accordance with RAGS Part B: chemicals with Henry's Law constants greater than 1E-5 and molecular weight less than 200 are now marked as VOCs. This increases consistency with the national guidance and with other EPA regions that use risk-based screening numbers. The vast majority of the changes on this RBC table are adjustments to meet this criterion. A change in the VOC status only changes the tap water RBC. (Exceptions to the criterion: certain chemicals that are gases at showering temperature are also marked as VOCs, because the purpose of the VOC column is to indicate whether inhalation should be considered as part of the tap water RBC.)

- Earlier versions of this Table included soil screening levels (SSLs), when those values were available in draft form. Since the finalization of the SSL Guidance, risk assessors are urged to consult the final SSL Guidance directly. The Guidance has detailed recommendations on site-specific sampling and site-specific SSL generation. (Soil Screening Guidance: User's Guide, April 1996, Publication 9355.4-23; and Soil Screening Guidance: Technical Background Document, May 1996; EPA/540/R-95/128)

- One user of the Table pointed out that the CAS numbers do not contain the dashes that are part of their format. CAS numbers have always appeared on the Table without dashes, but may be converted to their dashed form by placing a dash before the last number (farthest to the right), then moving two places to the left and placing another dash. For example, "107131" becomes "107-13-1"; "7440360" becomes "7440-36-0"; "25057890" becomes "25057-89-0." Region III could add the dashes directly to the Table, but we do not wish to make this change without feedback from users on whether this would adversely affect them. Therefore, we are soliciting comments on this issue (see box on first page for address). Over the last six months, no comments have been received on this issue.

FREQUENTLY ASKED QUESTIONS

To help you better understand the RBC Table, here are answers to our most often-asked questions:

1. How can the age-adjusted inhalation factor (11.66) be less than the inhalation rate for either a child (12) or an adult (20)?

   Age-adjusted factors are not intake rates, but rather partial calculations which have different units from intake rates. (Therefore, they are not directly comparable.) The fact that these partial calculations have values similar to intake rates is really coincidental, an artifact of the similar magnitude of years of exposure and time-averaged body weight.

2. For manganese, IRIS shows an oral RfD of 0.14 mg/kg/day, but the RBC Table uses 2E-2 mg/kg/day. Why?

   The IRIS RfD includes manganese from all sources, including diet. The explanatory text in IRIS recommends using a modifying factor of 3 when calculating risks associated with non-food sources, and the Table follows this recommendation. IRIS also recommends subtracting dietary exposure (default assumption in this case 5 mg). Thus, the IRIS RfD has been lowered by a factor of 2 x 3, or 6. The Table now reflects manganese RBCs for both "food" and "non-food" (most environmental) sources.

3. What is the source of the child's inhalation rate of 12 m^3/day?

   The calculation comes from basic physiology. It's a scaling of the mass-specific 20 m^3/day rate for adults from a body mass of 70 kg to 15 kg, using the 2/3 power of mass, as follows:

   Ircm = mass-specific child inhalation rate (m^3/kg/day)
   Irc = child inhalation rate (m^3/day)

   20 m^3/day / 70 kg = 0.286 m^3/kg/day (mass-specific adult inhalation rate)

   0.286 m^3/kg/day x $(70^{0.67})$ = (Ircm) x $(15^{0.67})$

   Ircm = 0.803 m^3/kg/day

   Irc = Ircm x 15 kg = 0.803 m^3/kg/day x 15 kg = 12.04 m^3/day

4. Can the oral RfDs in the RBC Table be applied to dermal exposure?

   Not directly. Oral RfDs are usually based on administered dose and therefore tacitly include a GI absorption factor. Thus, any use of oral RfDs in dermal risk calculations should involve removing this absorption factor. Consult the Risk Assessment Guidance for Superfund, Part A, Appendix A, for further details on how to do this.

5. The exposure variables table in the RBC background document lists the averaging time

for non-carcinogens as "ED*365." What does that mean?

ED is exposure duration, in years, and * is the computer-esc symbol for multiplication. Multiplying ED by 365 simply converts the duration to days. In fact, the ED term is included in both the numerator and denominator of the RBC algorithms for non-cancer risk, canceling it altogether. See RAGS for more information.

6. Why is inorganic lead not included in the RBC Table?

EPA has no consensus RfD or CSF for inorganic lead, so it is not possible to calculate RBCs as we have done for other chemicals. EPA considers lead to be a special case because of the difficulty in identifying the classic "threshold" needed to develop an RfD.

EPA therefore evaluates lead exposure by using blood-lead modeling, such as the Integrated Exposure-Uptake Biokinetic Model (IEUBK). The EPA Office of Solid Waste has also released a detailed directive on risk assessment and cleanup of residential soil lead. The directive recommends that soil lead levels less than 400 mg/kg are generally safe for residential use. Above that level, the document suggests collecting data and modeling blood-lead levels with the IEUBK model. For the purposes of screening, therefore, 400 mg/kg is recommended for residential soils. For water, we suggest 15 ug/l (the EPA Action Level in water), and for air, the National Ambient Air Quality Standard.

7. Where did the CSFs for carcinogenic PAHs come from?

The PAH CSFs are all calculated relative to benzo[a]pyrene, which has an IRIS slope factor. The relative factors for the other PAHs can be found in "Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons," Final Draft, ECAO-CIN-842 (March, 1993).

8. May I please have a copy of a previous RBC Table?

We do not distribute outdated copies of the RBC Table. Each new version of the Table supersedes all previous versions.

9. Please elaborate on the meaning of the "W" source code in the Table.

The "W" code means that a RfD or CSF is currently not present on either IRIS or HEAST, but that it was once present on either IRIS or HEAST and was removed. Such withdrawal usually indicates that consensus on the number no longer exists among EPA scientists, but not that EPA believes the contaminant to be unimportant.

Withdrawn numbers are shown in the Table because we still need to deal with these contaminants during the long delays before replacement numbers are ready. For the purpose of screening, a "W" value is similar to a provisional value in that neither value

has achieved Agency consensus. The "W" code should serve as a clear warning that before making any serious decision involving that contaminant, you will need to develop an interim value based on current scientific understanding.

If you are assessing risks at a site where a major contaminant is coded "W," consider working with your Region EPA risk assessor to develop a current toxicity constant. If the site is being studied under CERCLA, the EPA-NCEA Regional Technical Support group may be able to assist.

10. Can I get copies of supporting documents for interim toxicity constants which are coded "E" in the RBC Table?

Unfortunately, Region 3 does not have a complete set of supporting documents. The EPA-NCEA Superfund Technical Support Center prepares these interim toxicity constants in response to site-specific requests from Regional risk assessors, and sends the documentation only to the requestor. The RBC Tables contain only the latest interim values that we've either requested or have otherwise received. NCEA maintains the master data base of these chemicals, but will not release documentation of provisional values unless they are recent. Furthermore, since NCEA's Superfund Technical Support Center is mainly for the support of Superfund, it usually cannot develop new criteria unless authorized to do so for a specific Superfund project.

If an "E"-coded contaminant is a chemical of potential concern at your site, we urge you to work with the EPA Regional risk assessor assigned to the project in order to develop or obtain documentation for provisional values. EPA Region 3 furnishes documents only when needed to support Regional risk assessments or recommendations.

11. Why is there no oral RfD for mercury? How should I handle mercury?

IRIS gives oral RfDs for mercuric chloride and for methylmercury, but not for elemental mercury. Therefore, the RBC Table reflects this primary source. Consult your toxicologist to determine which of the available mercury numbers is suitable for the conditions at your site (e.g., whether mercury is likely to be organic or inorganic.)

Attachment

"DISCONTINUED" CHEMICALS

These chemicals may still have toxicity criteria available in IRIS, HEAST, or NCEA provisional values. However, they are not routine chemicals and therefore will not be routinely maintained in the RBC Table, unless our Table users report a significant need for chemicals to be re-added. Some of the chemicals on this Table were deleted because supporting toxicity information has been withdrawn or is unavailable.

acephate
acetone cyanohyrin
acifluorfen
acrylic acid
ally
allyl alcohol
aluminum phosphide
amdro
ametryn
m-aminophenol
amitraz
ammonium sulfamate
antimony potassium tartrate
apollo
aramite
asulam
avermectin B1
barium cyanide
bayleton
benefin
benomyl
benzotrichloride
bidrin
biphenthin
bis(2-chloro-1-methylethyl)ether
bisphenol A
boron trifluoride
4-bromophenyl phenyl ether
bromoxynil
bromoxynil octanoate
butylphthalyl butylglycolate
cacodylic acid
captafol
captan
carboxin
chloramben
chlorimuron-ethyl
chloroacetaldehyde
2-chloroacetophenone
4-chlorobenzotrifluoride
2-chloroethyl vinyl ether
4-chloro-2-methylaniline hydrochloride
chlorothalonil
chlorpropham
chlorsulfuron
chlorthiophos
coal tar creosote
cyclohexlamine
cyromazine
danitol
decabromodiphenyl ether
demeton
diallate
diethylforamide
diflubenzuron
dimethipin
dimethoate
N,N-dimethylformamide
dimethyl terephthalate
diphenamid
direct black 38
direct blue 6
direct brown 95
dodine
1,2-epoxybutane
ethephon
2-ethoxyethanol acetate
ethyl acrylate
EPTC

ethylene cyanohydrin
ethyl p-nitrophenyl phenylphosphorothioate
ethylphthalyl ethyl glycolate
express
fluoridone
flurprimidol
flutolanil
fluvalinate
folpet
fosteyl-al
furium
furmecyclox
glufosinate-ammonium
haloxyfop-methyl
harmony
imazalil
imazaquin
iprodione
isoxaben
kepone
lactofen
linuron
londax
maleic hydrazide
malononitrile
mancozeb
maneb
merphos
merphos oxide
metalaxyl
methamidophos
methomyl
2-methoxyethanol acetate
2-methoxyethanol
2-methoxy-5-nitroaniline
2-methylaniline hydrochloride
methyl chlorocarbonate
4,4-methylene bisbenzeneamine
metribuzin
molinate
2-naphthylamine
napropamide
nickel subsulfide
nitrapyrin
3-nitroaniline
4-nitroaniline
nitroguanidine
norflurazon
octabromodiphenyl ether
octamethylpyrophosphoramide
paclobutrazol
pebulate
pendimethalin
pentabromo-6-chlorocyclohexane
pentabromodiphenyl ether
phenmedipham
phenylmercuric acetate
phorate
phosmet
picloram
pirimiphos-methyl
prochloraz
profluralin
pronamide
propargyl alcohol
propazine
propham
propiconazole
propylene oxide
pydrin
quinalphos
savey
selenourea
sethoxydim
sodium fluoroacetate
sodium metavanadate
systhane
tebuthiuron
temephos
terbacil
terbufos
terbutryn

tetrachlorovinphos
tetraethyldithiopyrophosphate
thallium selenide
2-(thiocyanomethylthio)-benzothiazole
thiofanox
thiophanate-methyl
thiram
tralomethrin
triallate
triasulfuron
2,4,6-trichloroaniline hydrochloride
tridiphane
triethylamine
trifluralin
vernam

Sources: I = IRIS H = HEAST A = HEAST Alternate W = Withdrawn from IRIS or HEAST
E = EPA-NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfDi mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg	
**ACETALDEHYDE	75070					2.57E-003	I	7.7E-003	I	y	1.6E+000	C	8.1E-00	C						
ACETOCHLOR	34256821	2E-002	I								7.3E+002	N	7.3E+00	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
**ACETONE	67641	1.00E-001	I							y	6.1E+002	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
**ACETONITRILE	75058					1.7E-002	I			y	1.2E+002	N	6.2E+00	N						
ACETOPHENONE	98862	1.00E-001	I			5.70E-006	W			y	4.2E-002	N	2.1E-002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
ACROLEIN	107028	2.00E-002	H			5.70E-006	I			y	4.2E-002	N	2.1E-002	N	2.7E+00	N	4.1E+004	N	1.6E+003	N
ACRYLAMIDE	79061	2.00E-004	I	4.50E+000	I			4.50E+000	I		1.5E-002	C	1.4E-003	C	7.0E-004	C	1.3E+000	C	1.4E-001	C
**ACRYLONITRILE	107131	1.00E-003	H	5.40E-001	I	5.70E-004	I	2.40E-001		y	3.7E-002	C	2.6E-002	C	5.8E-003	C	1.1E+001	C	1.2E+000	C
ALACHLOR	15972608	1.00E-002	I	8.00E-002	H						8.4E-001	C	7.8E-002	C	3.9E-002	C	7.2E+001	C	8.0E+000	C
ALAR	1596845	1.50E-001	I								5.5E+003	N	5.5E+002	N	2.0E+002	N	3.1E+005	N	1.2E+004	N
ALDICARB	116063	1.00E-003	I								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N
ALDICARB SULFONE	1646884	1.00E-003	I								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N
ALDRIN	309002	3.00E-005	I	1.70E+001	I			1.70E+001			3.9E-003	C	3.7E-004	C	1.9E-004	C	3.4E-001	C	3.8E 002	C
ALUMINUM	*7429905*	*1.00E+000*	*E*			*1.00E-003*	*E*				*3.7E+004*	*N*	*3.7E+000*	*N*	*1.4E+003*	*N*	*2.0E+006*	*N*	*7.8E+004*	*N*
AMINODINITROTOLUENES		6.00E-005	E								2.2E+000	N	2.2E-001	N	8.1E-002	N	1.2E+002	N	4.7E+000	N
4-AMINOPYRIDINE	504245	2.00E-005	H								7.3E-001	N	7.3E-002	N	2.7E-002	N	4.1E+001	N	1.6E+000	N
AMMONIA	7664417					2.86E-002	I			y	2.1E+002	N	1.0E+002	N						
**ANILINE	62533	7.00E-003	E	5.70E-003	I	2.90E-004	I				1.2E+001	C	1.1E+000	N	5.5E-001	C	1.0E+003	C	1.1E+002	C I
ANTIMONY	7440360	4.00E-004	I								1.5E+001	N	1.5E+000	N	5.4E-001	N	8.2E+002	N	3.1E+001	N
ANTIMONY PENTOXIDE	1314609	5.00E-004	H								1.8E+001	N	1.8E+000	N	6.8E-001	N	1.0E+003	N	3.9E+001	N
ANTIMONY TETROXIDE	1332816	4.00E-004	H								1.5E+001	N	1.5E+000	N	5.4E-001	N	8.2E+002	N	3.1E+001	N
ANTIMONY TRIOXIDE	1309644	4.00E-004	H			5.70E-005	I				1.5E+001	N	2.1E-001	N	5.4E-001	N	8.2E+002	N	3.1E+001	N
ARSENIC	7440382	3.00E-004	I	1.50E+000	I			1.51E+001	I		4.5E-002	C	4.1E-004	C	2.1E-003	C	3.8E+000	C	4.3E-001	C
ARSINE	7784421					1.40E-005	I			y	1.0E-001	N	5.1E-002	N						
ASSURE	76578148	9.00E-003	I								3.3E+002	N	3.3E+001	N	1.2E+001	N	1.8E+004	N	7.0E+002	N
ATRAZINE	1912249	3.50E-002	I	2.20E-001	H						3.0E-001	C	2.8E-002	C	1.4E-002	C	2.6E+001	C	2.9E+000	C
AZOBENZENE	103333			1.10E-001	I			1.10E-001	I		6.1E-001	C	5.7E-002	C	2.9E-002	C	5.2E+001	C	5.6E+000	C
BARIUM	7440393	7.00E-002	I			1.40E-004	A				2.6E+003	N	5.1E-001	N	9.5E+001	N	1.4E+005	N	5.5E+003	N
BAYGON	114261	4.00E-003	I								1.5E+002	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N
BAYTHROID	68359375	2.50E-002	I								9.1E+002	N	9.1E+001	N	3.4E+001	N	5.1E+004	N	2.0E+003	N
BENTAZON	25057890	3.00E-002	I								1.1E+003	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
BENZALDEHYDE	100527	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
BENZENE	71432	3.00E-003	E	2.90E-002	I	1.70E-003	E	2.90E-002	I	y	3.6E-001	C	2.2E-001	C	1.1E-001	C	2.0E+002	C	2.2E+001	C
BENZENETHIOL	108985	1.00E-005	H							y	6.1E-002	N	3.7E-002	N	1.4E-002	N	2.0E+001	N	7.8E-001	N
BENZIDINE	92875	3.00E-003	I	2.30E+002	I			2.30E+002	I		2.9E-004	C	2.7E-005	C	1.4E-005	C	2.5E-002	C	2.8E-003	C
BENZOIC ACID	65850	4.00E+000	I								1.5E+005	N	1.5E+004	N	5.4E+003	N	8.2E+006	N	3.1E+005	N
BENZYL ALCOHOL	100516	3.00E-001	H								1.1E+004	N	1.1E+003	N	4.1E+002	N	6.1E+005	N	2.3E+004	N
BENZYL CHLORIDE	100447			0.17	I					y	5.2E-002	C	3.7E-002	C	1.9E-002	C	3.4E+001	C	3.8E+000	C
BERYLLIUM	7440417	2.00E-003	I			5.7E-006	I	8.40E+000	I		7.3E+001	N	7.5E-004	C	2.7E+000	N	4.1E+003	N	1.6E+002	N
BIPHENYL	92524	5.00E-002	I							y	3.0E+002	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
**BIS(2-CHLOROETHYL)ETHER	111444			1.10E+000	I			1.10E+000	I	y	9.6E-003	C	5.7E-003	C	2.9E-003	C	5.2E+000	C	5.9E-001	C
BIS(2-CHLOROISOPROPYL)ETHER	108601	4.00E-002	I	7.00E-002	H			3.50E-002	H	y	2.6E-001	C	1.8E-001	C	4.5E-002	C	8.2E+001	C	9.1E+000	C
BIS(CHLOROMETHYL)ETHER	542881			2.20E+002	I			2.20E+002	I	y	4.8E-005	C	2.8E-005	C	1.4E-005	C	2.6E-002	C	2.9E-003	C
BIS(2-ETHYLHEXYL)PHTHALATE	117817	2.00E-002	I	1.40E-002	I			1.40E-002	E		4.8E+000	C	4.5E-001	C	2.3E-001	C	4.1E+002	C	4.6E+001	C
BORON	7440428	9.00E-002	I			5.70E-003	H				3.3E+003	N	2.1E+001	N	1.2E+002	N	1.8E+005	N	7.0E+003	N

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Basis: C = Carcinogenic effects N = Noncarcinogenic effects = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfDi mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg	
BROMODICHLOROMETHANE	75274	2.00E-002	I	6.20E-002	I					y	1.7E-001	C	1.0E-00	C	5.1E-002	C	9.2E+001	C	1.0E+001	C
BROMOETHENE	593602					8.6E-004	I	1.10E-001	H	y	1.1E-001	C	5.7E-002	C						
**BROMOFORM	75252	2.00E-002	I	7.90E-003	I			3.90E-003	I		8.5E+000	C	1.6E+000	C	4.0E-001	C	7.2E+002	C	8.1E+001	C
BROMOMETHANE	74839	1.40E-003	I			1.40E-003	I			y	8.5E+000	N	5.1E+000	N	1.9E+000	N	2.9E+003	N	1.1E+002	N
**BROMOPHOS	2104963	5.00E-003	H								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
1,3-BUTADIENE	106990							1.80E+000	H	y	7.0E-003	C	3.5E-003	C						
1-BUTANOL	71363	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
BUTYLBENZYLPHTHALATE	85687	2.00E-001	I								7.3E+003	N	7.3E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
BUTYLATE	2008415	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.3E+001	N	1.0E+005	N	3.9E+003	N
N-BUTYLBENZENE	104518	1.00E-002	E							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
SEC-BUTYLBENZENE	135988	1.00E-002	E							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
TERT-BUTYLBENZENE	98066	1.00E-002	E							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
CADMIUM-WATER	7440439	5.00E-004	I					6.30E+000	I		1.8E+001	N	9.9E-004	C	6.8E-001	N	1.0E+003	N	3.9E+001	N
CADMIUM-FOOD	7440439	1.00E-003	I					6.30E+000	I		3.7E+001	N	9.9E-004	C	1.4E+000	N	2.0E+003	N	7.8E+001	N
CAPROLACTAM	105602	5.00E-001	I								1.8E+004	N	1.8E+003	N	6.8E+002	N	1.0E+006	N	3.9E+004	N
CARBARYL	63252	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
CARBON DISULFIDE	75150	1.00E-001	I			2.00E-001	I			y	1.0E+003	N	7.3E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
CARBON TETRACHLORIDE	56235	7.00E-004	I	1.30E-001	I	5.71E-004	E	5.30E-002	I	y	1.6E-001	C	1.2E-001	C	2.4E-002	C	4.4E+001	C	4.9E+000	C
CARBOSULFAN	55285148	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
**CHLORAL	75876	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
CHLORANIL	118752			4.00E-001	H						1.7E-001	C	1.6E-002	C	7.9E-003	C	1.4E+001	C	1.6E+000	C
CHLORDANE	57749	5.00E-004	I	3.5E-001	I	2.00E-004	I	3.5E-001	I		1.9E-001	C	1.8E-002	C	9.0E-003	C	1.6E+001	C	1.8E+000	C
CHLORINE	7782505	1.00E-001	I							y	6.1E+002	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
CHLORINE DIOXIDE	10049044					5.70E-005	I			y	4.2E-001	N	2.1E-001	N						
CHLOROACETIC ACID	79118	2.00E-003	H								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
4-CHLOROANILINE	106478	4.00E-003	I								1.5E+002	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N
**CHLOROBENZENE	108907	2.00E-002	I			1.7E-002	E			y	1.1E+002	N	6.2E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
CHLOROBENZILATE	510156	2.00E-002	I	2.70E-001	H			2.70E-001	H		2.5E-001	C	2.3E-002	C	1.2E-002	C	2.1E+001	C	2.4E+000	C
P-CHLOROBENZOIC ACID	74113	2.00E-001	H								7.3E+003	N	7.3E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
2-CHLORO-1,3-BUTADIENE	126998	2.00E-002	A			2.00E-003	H			y	1.4E+001	N	7.3E+000	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
1-CHLOROBUTANE	109693	4.00E-001	H							y	2.4E+003	N	1.5E+003	N	5.4E+002	N	8.2E+005	N	3.1E+004	N
1-CHLORO-1,1-DIFLUOROETHANE	75683					1.40E+001	I			y	1.0E+005	N	5.1E+004	N						
CHLORODIFLUOROMETHANE	75456					1.40E+001	I			y	1.0E+005	N	5.1E+004	N						
CHLOROETHANE	75003	4.00E-001	E	2.90E-003	E	2.90E+000	I			y	3.6E+000	C	2.2E+000	C	1.1E+000	C	2.0E+003	C	2.2E+002	C
CHLOROFORM	67663	1.00E-002	I	6.10E-003	I	8.6E-005	E	8.10E-002	I	y	1.5E-001	C !	7.7E-002	C !	5.2E-001	C	9.4E+002	C	1.0E+002	C !
**CHLOROMETHANE	74873			1.30E-002	H	8.6E 002	E	3.5E-003	E	y	2.1E+000	C	1.8E+000	C	2.4E-001	C	4.4E+002	C	4.9E+001	C
4-CHLORO-2-METHYLANILINE	95692			5.80E-001	H						1.2E-001	C	1.1E-002	C	5.4E-003	C	9.9E+000	C	1.1E+000	C
BETA-CHLORONAPHTHALENE	91587	8.00E-002	I							y	4.9E+002	N	2.9E+002	N	1.1E+002	N	1.6E+005	N	6.3E+003	N
O-CHLORONITROBENZENE	88733			2.50E-002	H					y	4.2E-001	C	2.5E-001	C	1.3E-001	C	2.3E+002	C	2.6E+001	C
P-CHLORONITROBENZENE	100005			1.80E-002	H					y	5.9E-001	C	3.5E-001	C	1.8E-001	C	3.2E+002	C	3.5E+001	C
**2-CHLOROPHENOL	95578	5.00E-003	I							y	3.0E+001	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
2-CHLOROPROPANE	75296					2.90E-002	H			y	2.1E+002	N	1.1E+002	N						
O-CHLOROTOLUENE	95498	2.00E-002	I							y	1.2E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
CHLORPYRIFOS	2921882	3.00E-003	I								1.1E+002	N	1.1E+001	N	4.1E+000	N	6.1E+003	N	2.3E+002	N
CHLORPYRIFOS-METHYL	5598130	1.00E-002	H								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N

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Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfDi mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg	
CHROMIUM III	16065831	1.50E+000	I								5.5E+004	N	5.5E+003	N	2.0E+003	N	3.1E+006	N	1.2E+005	N
CHROMIUM VI	18540299	3.00E-003	I			3.00E-005	I	4.10E+001	H		1.1E+002	N	1.5E-004	C	4.1E+000	N	6.1E+003	N	2.3E+002	N
COBALT	7440484	6.00E-002	E								2.2E+003	N	2.2E+002	N	8.1E+001	N	1.2E+005	N	4.7E+003	N
**COKE OVEN EMISSIONS (COAL TAR)	8007452							2.2					2.8E-003	C						
COPPER	7440508	4.00E-002	H								1.5E+003	N	1.5E+002	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
**CROTONALDEHYDE	123739			1.90E+000	H					y	5.6E-003	C	3.3E-003	C	1.7E-003	C	3.0E+000	C	3.4E-001	C
CUMENE	98828	1.00E-001	I			1.10E-001	I			y	6.6E+002	N	4.0E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
CYANIDE (FREE)	57125	2.00E-002	I								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
CALCIUM CYANIDE	592018	4E-002	I								1.5E+003	N	1.5E+002	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
COPPER CYANIDE	544923	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
CYANAZINE	21725462	2.00E-003	H	8.40E-001	H						8.0E-002	C	7.5E-003	C	3.8E-003	C	6.8E+000	C	7.6E-001	C
CYANOGEN	460195	4.00E-002	I							y	2.4E+002	N	1.5E+002	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
CYANOGEN BROMIDE	506683	9.00E-002	I								3.3E+003	N	3.3E+002	N	1.2E+002	N	1.8E+005	N	7.0E+003	N
CYANOGEN CHLORIDE	506774	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
HYDROGEN CYANIDE	74908	2.00E-002	I			8.60E-004	I			y	6.2E+000	N	3.1E+000	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
POTASSIUM CYANIDE	151508	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
POTASSIUM SILVER CYANIDE	506616	2.00E-001	I								7.3E+003	N	7.3E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
SILVER CYANIDE	506649	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
SODIUM CYANIDE	143339	4.00E-002	I								1.5E+003	N	1.5E+002	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
THIOCYANATE		1.00E-001	E								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
ZINC CYANIDE	557211	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
CYCLOHEXANONE	108941	5.00E+000	I								1.8E+005	N	1.8E+004	N	6.8E+003	N	1.0E+007	N	3.9E+005	N
CYHALOTHRIN/KARATE	68085858	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
CYPERMETHRIN	52315078	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
DACTHAL	1861321	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
DALAPON	75990	3.00E-002	I								1.1E+003	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
DDD	72548			2.40E-001	I						2.8E-001	C	2.6E-002	C	1.3E-002	C	2.4E+001	C	2.7E+000	C
DDE	72559			3.40E-001	I						2.0E-001	C	1.8E-002	C	9.3E-003	C	1.7E+001	C	1.9E+000	C
DDT	50293	5.00E-004	I	3.40E-001	I			3.40E-001	I		2.0E-001	C	1.8E-002	C	9.3E-003	C	1.7E+001	C	1.9E+000	C
DIAZINON	333415	9.00E-004	H								3.3E+001	N	3.3E+000	N	1.2E+000	N	1.8E+003	N	7.0E+001	N
DIBENZOFURAN	132649	4.00E-003	E							y	2.4E+001	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N
***,4-DIBROMOBENZENE	106376	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
DIBROMOCHLOROMETHANE	124481	2.00E-002	I	8.40E-002	I					y	1.3E-001	C	7.5E-002	C	3.8E-002	C	6.8E+001	C	7.6E+000	C
1,2-DIBROMO-3-CHLOROPROPANE	96128			1.40E+000	H	5.70E-005	I	2.40E-003	H	y	4.7E-002	C	2.1E-001	N	2.3E-003	C	4.1E+000	C	4.6E-001	C
1,2-DIBROMOETHANE	106934			8.50E+001	I	5.70E-005	H	7.60E-001	I	y	7.5E-004	C	8.2E-003	C	3.7E-005	C	6.7E-002	C	7.5E-003	C
DIBUTYLPHTHALATE	84742	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
DICAMBA	1918009	3.00E-002	I								1.1E+003	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
1,2-DICHLOROBENZENE	95501	9.00E-002	I			9.00E-003	E			y	6.4E+001	N	3.3E+001	N	1.2E+002	N	1.8E+005	N	7.0E+003	N
***,3-DICHLOROBENZENE	541731	9.00E-004	E							y	5.5E+000	N	3.3E+000	N	1.2E+000	N	1.8E+003	N	7.0E+001	N
1,4-DICHLOROBENZENE	106467	3.00E-002	E	2.40E-002	H	2.29E-001	I	2.2E-002	E	y	4.7E-001	C	2.8E-001	C	1.3E-001	C	2.4E+002	C	2.7E+001	C
3,3'-DICHLOROBENZIDINE	91941			4.50E-001	I						1.5E-001	C	1.4E-002	C	7.0E-003	C	1.3E+001	C	1.4E+000	C
1,4-DICHLORO-2-BUTENE	764410							9.30E+000	H	y	1.3E-003	C	6.7E-004	C						
DICHLORODIFLUOROMETHANE	75718	2.00E-001	I			5.00E-002	A			y	3.5E+002	N	1.8E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
1,1-DICHLOROETHANE	75343	1.00E-001	H			1.40E-001	A			y	8.0E+002	N	5.1E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
1,2-DICHLOROETHANE	107062	3.00E-002	E	9.10E-002	I	1.40E-003	E	9.10E-002	I	y	1.2E-001	C	6.9E-002	C	3.5E-002	C	6.3E+001	C	7.0E+000	C

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Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfD mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg		
1,1-DICHLOROETHENE	75354	9.00E-003	I	6.00E-001	I			1.75E-001		y	4.4E-002	C	3.6E-002	C	5.3E-003	C	9.5E+000	C	1.1E+000	C	
CIS-1,2-DICHLOROETHENE	156592	1.00E-002	H							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N	
TRANS-1,2-DICHLOROETHENE	156605	2.00E-002	I							y	1.2E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N	
TOTAL 1,2-DICHLOROETHENE	540590	9.00E-003	H							y	5.5E+001	N	3.3E+001	N	1.2E+001	N	1.8E+004	N	7.0E+002	N	
2,4-DICHLOROPHENOL	120832	3.00E-003	I								1.1E+002	N	1.1E+001	N	4.1E+000	N	6.1E+003	N	2.3E+002	N	
**2,4-D	94757	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N	
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94826	8E-003	I								2.9E+002	N	2.9E+001	N	1.1E+001	N	1.6E+004	N	6.3E+002	N	
1,2-DICHLOROPROPANE	78875			6.80E-002	H	1.14E-003	I			y	1.6E-001	C	9.2E-002	C	4.6E-002	C	8.4E+001	C	9.4E+000	C	
2,3-DICHLOROPROPANOL	616239	3.00E-003	I								1.1E+002	N	1.1E+001	N	4.1E+000	N	6.1E+003	N	2.3E+002	N	
1,3-DICHLOROPROPENE	542756	3.00E-004	I	1.80E-001	H	5.71E-003	I	1.30E-001	H	y	7.7E-002	C	4.8E-002	C	1.8E-002	C	3.2E+001	C	3.5E+000	C	!
DICHLORVOS	62737	5E-004	I	0.29	I	1.43E-004	I				2.3E-001	C	2.2E-002	C	1.1E-002	C	2.0E+001	C	2.2E+000	C	
DICOFOL	115322			4.4E-001	W						1.5E-001	C	1.4E-002	C	7.2E-003	C	1.3E+001	C	1.5E+000	C	
DICYCLOPENTADIENE	77736	3E-002	H			6.00E-005	A			y	4.4E-001	N	2.2E-001	N	4.1E+001	N	6.1E+004	N	2.3E+003	N	
DIELDRIN	60571	5.00E-005	I	1.60E+001	I			1.60E+001	I		4.2E-003	C	3.9E-004	C	2.0E-004	C	3.6E-001	C	4.0E-002	C	
DIESEL EMISSIONS						1.40E-003	I						5.1E+000	N							
DIETHYLPHTHALATE	84662	8.00E-001	I								2.9E+004	N	2.9E+003	N	1.1E+003	N	1.6E+006	N	6.3E+004	N	
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112345					5.70E-003	H						2.1E+001	N							
DIETHYLENE GLYCOL, MONOETHYL ETHER	111900	2.00E+000	H								7.3E+004	N	7.3E+003	N	2.7E+003	N	4.1E+006	N	1.6E+005	N	
DI(2-ETHYLHEXYL)ADIPATE	103231	6.00E-001	I	1.20E-003	I						5.6E+001	C	5.2E+000	C	2.6E+000	C	4.8E+003	C	5.3E+002	C	
DIETHYLSTILBESTROL	56531			4.70E+003	H						1.4E-005	C	1.3E-006	C	6.7E-007	C	1.2E-003	C	1.4E-004	C	
DIFENZOQUAT (AVENGE)	43222486	8.00E-002	I								2.9E+003	N	2.9E+002	N	1.1E+002	N	1.6E+005	N	6.3E+003	N	
1,1-DIFLUOROETHANE	75376					1.10E+001	I			y	8.0E+004	N	4.0E+004	N							
DIISOPROPYL METHYLPHOSPHONATE (DMP)	1445756	8.00E-002	I								2.9E+003	N	2.9E+002	N	1.1E+002	N	1.6E+005	N	6.3E+003	N	
3,3'-DIMETHOXYBENZIDINE	119904			1.40E-002	H						4.8E+000	C	4.5E-001	C	2.3E-001	C	4.1E+002	C	4.6E+001	C	
**DIMETHYLAMINE	124403					5.70E-006	W			y	4.2E-002	N	2.1E-002	N							
2,4-DIMETHYLANILINE HYDROCHLORIDE	21436964			5.80E-001	H						1.2E-001	C	1.1E-002	C	5.4E-003	C	9.9E+000	C	1.1E+000	C	
2,4-DIMETHYLANILINE	95681			7.50E-001	H						8.9E-002	C	8.3E-003	C	4.2E-003	C	7.6E+000	C	8.5E-001	C	
N,N-DIMETHYLANILINE	121697	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N	
3,3'-DIMETHYLBENZIDINE	119937			9.20E+000	H						7.3E-003	C	6.8E-004	C	3.4E-004	C	6.2E-001	C	6.9E-002	C	
1,1-DIMETHYLHYDRAZINE	57147			2.60E+000	W			3.50E+000	W		2.6E-002	C	1.8E-003	C	1.2E-003	C	2.2E+000	C	2.5E-001	C	
1,2-DIMETHYLHYDRAZINE	540738			3.70E+001	W			3.70E+001	W		1.8E-003	C	1.7E-004	C	8.5E-005	C	1.5E-001	C	1.7E-002	C	
2,4-DIMETHYLPHENOL	105679	2.00E-002	I								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N	
2,3-DIMETHYLPHENOL	576261	6.00E-004	I								2.2E+001	N	2.2E+000	N	8.1E-001	N	1.2E+003	N	4.7E+001	N	
3,4-DIMETHYLPHENOL	95658	1.00E-003	I								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N	
DIMETHYLPHTHALATE	131113	1.00E+001	W								3.7E+005	N	3.7E+004	N	1.4E+004	N	2.0E+007	N	7.8E+005	N	
1,2-DINITROBENZENE	528290	4.00E-004	H								1.5E+001	N	1.5E+000	N	5.4E-001	N	8.2E+002	N	3.1E+001	N	
1,3-DINITROBENZENE	99650	1.00E-004	I								3.7E+000	N	3.7E-001	N	1.4E-001	N	2.0E+002	N	7.8E+000	N	
1,4-DINITROBENZENE	100254	4.00E-004	H								1.5E+001	N	1.5E+000	N	5.4E-001	N	8.2E+002	N	3.1E+001	N	
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131895	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N	
4,6-DINITRO-2-METHYLPHENOL	534521	1.00E-004	E								3.7E+000	N	3.7E-001	N	1.4E-001	N	2.0E+002	N	7.8E+000	N	
2,4-DINITROPHENOL	51285	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N	
DINITROTOLUENE MIX				6.80E-001	I						9.8E-002	C	9.2E-003	C	4.6E-003	C	8.4E+000	C	9.4E-001	C	
2,4-DINITROTOLUENE	121142	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N	
2,6-DINITROTOLUENE	606202	1.00E-003	H								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N	
**DINOSEB	88857	1.00E-003	I								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N	

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DIOCTYLPHTHALATE	117840	2.00E-002	H								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
1,4-DIOXANE	123911			1.10E-002	I						6.1E+000	C	5.7E-001	C	2.9E-001	C	5.2E+002	C	5.8E+001	C
DIPHENYLAMINE	122394	2.50E-002	I								9.1E+002	N	9.1E+001	N	3.4E+001	N	5.1E+004	N	2.0E+003	N
1,2-DIPHENYLHYDRAZINE	122667			8.00E-001	I			8.00E-001	I		8.4E-002	C	7.8E-003	C	3.9E-003	C	7.2E+000	C	8.0E-001	C
DIQUAT	85007	2.20E-003	I								8.0E+001	N	8.0E+000	N	3.0E+000	N	4.5E+003	N	1.7E+002	N
**DISULFOTON	298044	4.00E-005	I								1.5E+000	N	1.5E-001	N	5.4E-002	N	8.2E+001	N	3.1E+000	N
1,4-DITHIANE	505293	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
DIURON	330541	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
ENDOSULFAN	115297	6.00E-003	I								2.2E+002	N	2.2E+001	N	8.1E+000	N	1.2E+004	N	4.7E+002	N
ENDRIN	72208	3.00E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
**EPICHLOROHYDRIN	106898	2.00E-003	H	9.90E-003	I	2.86E-004	I	4.20E-003	I	y	2.0E+000	N	1.0E+000	N	3.2E-001	C !	5.8E+002	C !	6.5E+001	C !
ETHION	563122	5.00E-004	I								1.8E+001	N	1.8E+000	N	6.8E-001	N	1.0E+003	N	3.9E+001	N
2-ETHOXYETHANOL	110805	4.00E-001	H			5.70E-002	I				1.5E+004	N	2.1E+002	N	5.4E+002	N	8.2E+005	N	3.1E+004	N
ETHYL ACETATE	141786	9.00E-001	I							y	5.5E+003	N	3.3E+003	N	1.2E+003	N	1.8E+006	N	7.0E+004	N
ETHYLBENZENE	100414	1.00E-001	I			2.90E-001	I			y	1.3E+003	N	1.1E+003	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
ETHYLENE DIAMINE	107153	2.00E-002	H								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
ETHYLENE GLYCOL	107211	2.00E+000	I								7.3E+004	N	7.3E+003	N	2.7E+003	N	4.1E+006	N	1.6E+005	N
ETHYLENE GLYCOL, MONOBUTYL ETHER	111762					5.70E-003	H						2.1E+001	N						
**ETHYLENE OXIDE	75218			1.00E+000	H			3.50E-001	H	y	2.3E-002	C	1.8E-002	C	3.2E-003	C	5.7E+000	C	6.4E-001	C
ETHYLENE THIOUREA	96457	8.00E-005	I	1.1E-001	H						6.1E-001	C !	5.7E-002	C !	2.9E-002	C !	5.2E+001	C !	5.8E+000	C !
ETHYL ETHER	60297	2.00E-001	I							y	1.2E+003	N	7.3E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
ETHYL METHACRYLATE	97632	9.00E-002	H							y	5.5E+002	N	3.3E+002	N	1.2E+002	N	1.8E+005	N	7.0E+003	N
FENAMIPHOS	22224926	2.50E-004	I								9.1E+000	N	9.1E-001	N	3.4E-001	N	5.1E+002	N	2.0E+001	N
FLUOMETURON	2164172	1.30E-002	I								4.7E+002	N	4.7E+001	N	1.8E+001	N	2.7E+004	N	1.0E+003	N
FLUORINE	7782414	6.00E-002	I								2.2E+003	N	2.2E+002	N	8.1E+001	N	1.2E+005	N	4.7E+003	N
FOMESAFEN	72178020			1.90E-001	I						8.5E-001	C	3.3E-002	C	1.7E-002	C	3.0E+001	C	3.4E+000	C
FONOFOS	944229	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
FORMALDEHYDE	50000	2.00E-001	I					4.50E-002	I		7.3E+003	N	1.4E-00	C	2.7E+002	N	4.1E+005	N	1.6E+004	N
FORMIC ACID	64186	2.00E+000	H								7.3E+004	N	7.3E+003	N	2.7E+003	N	4.1E+006	N	1.6E+005	N
FURAN	110009	1.00E-003	I							y	6.1E+000	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N
FURAZOLIDONE	67458			3.80E+000	H						1.8E-002	C	1.6E-003	C	8.3E-004	C	1.5E+000	C	1.7E-001	C
FURFURAL	980?1	3.00E-003	I			1.00E-002	A				1.1E+002	N	3.7E+00	N	4.1E+000	N	6.1E+003	N	2.3E+002	N
GLYCIDALDEHYDE	765344	4.00E-004	I			2.90E-004	H				1.5E+001	N	1.1E+000	N	5.4E-001	N	8.2E+002	N	3.1E+001	N
GLYPHOSATE	1071836	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
**HEPTACHLOR	76448	5.00E-004	I	4.50E+000	I			4.50E+000	I		1.5E-002	C	1.4E-003	C	7.0E-004	C	1.3E+000	C	1.4E-001	C
**HEPTACHLOR EPOXIDE	1024573	1.30E-005	I	9.10E+000	I			9.10E+000	I		7.4E-003	C	6.9E-004	C	3.5E-004	C	6.3E-001	C	7.0E-002	C
HEXABROMOBENZENE	87821	2.00E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
**HEXACHLOROBENZENE	118741	8.00E-004	I	1.60E+000	I			1.60E+000	I		4.2E-002	C	3.9E-003	C	2.0E-003	C	3.6E+000	C	4.0E-001	C
**HEXACHLOROBUTADIENE	87683	2.00E-004	H	7.80E-002	I			7.80E-002	I		8.6E-001	C !	8.0E-002	C !	4.0E-002	C !	7.3E+001	C !	8.2E+000	C !
ALPHA-HCH	319846			6.30E+000	I			6.30E+000			1.1E-002	C	9.9E-004	C	5.0E-004	C	9.1E-001	C	1.0E-001	C
BETA-HCH	319857			1.80E+000	I			1.80E+000			3.7E-002	C	3.5E-003	C	1.8E-003	C	3.2E+000	C	3.5E-001	C
GAMMA-HCH (LINDANE)	58899	3.00E-004	I	1.30E+000	H						5.2E-002	C	4.8E-003	C	2.4E-003	C	4.4E+000	C	4.9E-001	C
TECHNICAL HCH	608731			1.80E+000	I			1.80E+000	I		3.7E-002	C	3.5E-003	C	1.8E-003	C	3.2E+000	C	3.5E-001	C
**HEXACHLOROCYCLOPENTADIENE	77474	7.00E-003	I			2.00E-005	H				2.6E+002	N	7.3E-002	N	9.5E+000	N	1.4E+004	N	5.5E+002	N
HEXACHLORODIBENZODIOXIN MIX	19408743			6.20E+003	I			4.55E+003			1.1E-005	C	1.4E-006	C	5.1E-007	C	9.2E-004	C	1.0E-004	C

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**HEXACHLOROETHANE	67721	1.00E-003	I	1.40E-002	I			1.40E-002	I		4.8E+000	C !	4.5E-001	C !	2.3E-001	C !	4.1E+002	C !	4.6E+001	C !
HEXACHLOROPHENE	70304	3.00E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
1,6-HEXAMETHYLENE DIISOCYANATE	822060					2.90E-006	I						1.1E-002	N						
HEXANE	110543	6.00E-002	H			5.71E-002	I			y	3.5E+002	N	2.1E+002	N	8.1E+001	N	1.2E+005	N	4.7E+003	N
2-HEXANONE	591786	4.00E-002	E			1.4E-003	E				1.5E+003	N	5.1E+000	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
HEXAZINONE	51235042	3.30E-002	I								1.2E+003	N	1.2E+002	N	4.5E+001	N	6.7E+004	N	2.6E+003	N
HNX	26914'0	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
HYDRAZINE	3020'2			3.00E+000	I			1.70E+001	I		2.2E-002	C	3.7E-004	C	1.1E-003	C	1.9E+000	C	2.'E-001	C
HYDROGEN CHLORIDE	76470'0					5.70E-003	I						2.1E+00'	N						
HYDROGEN SULFIDE	7783064	3.00E-003	I			2.85E-004	I				1.1E+002	N	1.0E+000	N	4.1E+000	N	6.1E+003	N	2.3E+002	N
HYDROQUINONE	1233'9	4.00E-002	H								1.5E+003	N	1.5E+002	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
IRON	7439896	3.00E-001	E								1.1E+004	N	1.1E+003	N	4.1E+002	N	6.1E+005	N	2.3E+004	N
ISOBUTANOL	78831	3.00E-001	I							y	1.8E+003	N	1.1E+003	N	4.1E+002	N	6.1E+005	N	2.3E+004	N
ISOPHORONE	78591	2.00E-001	I	9.50E-004	I						7.0E+001	C	6.6E+000	C	3.3E+000	C	6.0E+003	C	6.7E+002	C
ISOPROPALIN	33820530	1.50E-002	I								5.5E+002	N	5.5E+00'	N	2.0E+001	N	3.1E+004	N	1.2E+003	N
ISOPROPYL METHYL PHOSPHONIC ACID	1832548	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
**TETRAETHYLLEAD	78002	1.00E-007	I								3.7E-003	N	3.7E-004	N	1.4E-004	N	2.0E-001	N	7.8E-003	N
LITHIUM	7439932	2.00E-002	E								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
MALATHION	121755	2.00E-002	I								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
MALEIC ANHYDRIDE	108316	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
MANGANESE-NONFOOD	7439965	2.00E-002	I			1.43E-005	I				7.3E+002	N	5.2E-002	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
MANGANESE-FOOD	7439965	1.40E-001	I			1.43E-005	I				5.1E+003	N	5.2E-002	N	1.9E+002	N	2.9E+005	N	1.1E+004	N
MEPHOSFOLAN	950107	9.00E-005	H								3.3E+000	N	3.3E-001	N	1.2E-001	N	1.8E+002	N	7.0E+000	N
MEPIQUAT CHLORIDE	24307264	3.00E-002	I								1.1E+003	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
MERCURIC CHLORIDE	7487947	3.00E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
MERCURY (INORGANIC)	7439976					8.60E-005	I						3.1E-001	N						
METHYLMERCURY	22967926	1.00E-004	I								3.7E+000	N	3.7E-001	N	1.4E-001	N	2.0E+002	N	7.8E+000	N
METHACRYLONITRILE	126987	1.00E-004	I			2.00E-004	A			y	1.0E+000	N	7.3E-001	N	1.4E-001	N	2.0E+002	N	7.8E+000	N
METHANOL	67561	5.00E-001	I								1.8E+004	N	1.8E+003	N	6.8E+002	N	1.0E+006	N	3.9E+004	N
METHIDATHION	950378	1.00E-003	I								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N
METHOXYCHLOR	72435	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
METHYL ACETATE	79209	1.00E+000	H							y	6.1E+003	N	3.7E+003	N	1.4E+003	N	2.0E+006	N	7.8E+004	N
METHYL ACRYLATE	96333	3.00E-002	A							y	1.8E+002	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
2-METHYLANILINE	95534			2.40E-001	H						2.8E-001	C	2.6E-002	C	1.3E-002	C	2.4E+001	C	2.7E+000	C
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94815	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94746	5.00E-004	I								1.8E+001	N	1.8E+000	N	6.8E-001	N	1.0E+003	N	3.9E+001	N
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCP	93652	1.00E-003	I								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N
METHYLCYCLOHEXANE	108872					8.60E-001	H			y	6.3E+003	N	3.1E+003	N						
METHYLENE BROMIDE	74953	1.00E-002	A							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
METHYLENE CHLORIDE	75092	6.00E-002	I	7.50E-003	I	8.60E-001	H	1.65E-003	I	y	4.1E+000	C	3.8E+000	C	4.2E-001	C	7.6E+002	C	8.5E+001	C
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101144	7.00E-004	H	1.30E-001	H			1.30E-001	H		5.2E-001	C	4.8E-002	C	2.4E-002	C	4.4E+001	C	4.9E+000	C
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101611			4.60E-002	I						1.5E+000	C	1.4E-001	C	6.9E-002	C	1.2E+002	C	1.4E+001	C
4,4'-METHYLENEDIPHENYL ISOCYANATE	101688					1.7E-004	I						6.2E-001	N						
METHYL ETHYL KETONE (2-BUTANONE)	78933	6.00E-001	I			2.86E-001	I			y	1.9E+003	N	1.0E+003	N	8.1E+002	N	1.2E+006	N	4.7E+004	N
METHYL HYDRAZINE	60344			1.10E+000	W						6.1E-002	C	5.7E-003	C	2.9E-003	C	5.2E+000	C	5.8E-001	C

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Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfD mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg	
**METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	108101	8.00E-002	H			2.00E-002	A			y	1.4E+002	N	7.3E+001	N	1.1E+002	N	1.6E+005	N	6.3E+003	N
METHYL METHACRYLATE	80626	1.40E+000	I			2.00E-001	I			y	1.4E+003	N	7.3E+002	N	1.9E+003	N	2.9E+006	N	1.1E+005	N
2-METHYL-5-NITROANILINE	99558			3.30E-002	H						2.0E+000	C	1.9E-001	C	9.6E-002	C	1.7E+002	C	1.9E+001	C
METHYL PARATHION	298000	2.50E-004	I								9.1E+000	N	9.1E-001	N	3.4E-001	N	5.1E+002	N	2.0E+001	N
2-METHYLPHENOL	95487	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.3E+001	N	1.0E+005	N	3.9E+003	N
3-METHYLPHENOL	108394	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.3E+001	N	1.0E+005	N!	3.9E+003	N
4-METHYLPHENOL	106445	5.00E-003	H								1.8E+002	N	1.8E+001	N	6.3E+000	N	1.0E+004	N	3.9E+002	N
METHYLSTYRENE MIX	25013154	6.00E-003	A			1.00E-002	A			y	5.5E+001	N	3.7E+001	N	8.1E+000	N	1.2E+004	N	4.7E+002	N
ALPHA-METHYLSTYRENE	98839	7.00E-002	A							y	4.3E+002	N	2.6E+002	N	9.5E+001	N	1.4E+005	N	5.5E+003	N
METHYL TERT-BUTYL ETHER	1634044					8.57E-001	I			y	6.3E+003	N	3.1E+003	N						
METOLACHLOR (DUAL)	51218452	1.50E-001	I								5.5E+003	N	5.5E+002	N	2.0E+002	N	3.1E+005	N	1.2E+004	N
**MIREX	2385855	2.00E-004	I								7.3E+000	N	7.3E-001	N	2.7E-001	N	4.1E+002	N	1.6E+001	N
MOLYBDENUM	7439987	5E-003	I								1.8E+002	N	1.8E+001	N	6.9E+000	N	1.0E+004	N	3.9E+002	N
**MONOCHLORAMINE	10599903	1E-001	I			1.00E-001	H				3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
NALED	300765	2E-003	I								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
NICKEL REFINERY DUST								8.4E-001	I				7.5E-003	C						
NICKEL	7440020	2.00E-002	I								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
NITRATE	14797558	1.60E+000	I								5.8E+004	N	5.8E+003	N	2.2E+003	N	3.3E+006	N	1.3E+005	N
NITRIC OXIDE	10102439	1.00E-001	W							y	6.1E+002	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
NITRITE	14797650	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
2-NITROANILINE	88744					5.70E-005	H						2.1E-001	N						
NITROBENZENE	98953	5.00E-004	I			6.00E-004	A			y	3.5E+000	N	2.2E+000	N	6.8E-001	N	1.0E+003	N	3.9E+001	N
NITROFURANTOIN	67209	7.00E-002	H								2.6E+003	N	2.6E+002	N	9.5E+001	N	1.4E+005	N	5.5E+003	N
NITROFURAZONE	59870			1.50E+000	H						4.5E-002	C	4.2E-003	C	2.1E-003	C	3.8E+000	C	4.3E-001	C
NITROGEN DIOXIDE	10102440	1.00E+000	W							y	6.1E+003	N	3.7E+003	N	1.4E+003	N	2.0E+006	N	7.8E+004	N
NITROGLYCERIN	55630			1.4E-002	E						4.8E+000	C	4.5E-001	C	2.3E-001	C	4.1E+002	C	4.6E+001	C
4-NITROPHENOL	100027	8.00E-003	E								2.9E+002	N	2.9E+001	N	1.1E+001	N	1.6E+004	N	6.3E+002	N
2-NITROPROPANE	79469					5.70E-003	I	9.40E+000	H	y	1.3E-003	C	6.7E-004	C						
**N-NITROSO-DI-N-BUTYLAMINE	924163			5.40E+000	I			5.60E+000	I	y	1.9E-003	C	1.1E-003	C	5.8E-004	C	1.1E+000	C	1.2E-001	C
N-NITROSODIETHANOLAMINE	1116547			2.80E+000	I						2.4E-002	C	2.2E-003	C	1.1E-003	C	2.0E+000	C	2.3E-001	C
N-NITROSODIETHYLAMINE	55185			1.50E+002	I			1.50E+002	I		4.5E-004	C	4.2E-005	C	2.1E-005	C	3.8E-002	C	4.3E-003	C
N-NITROSODIMETHYLAMINE	62759			5.10E+001	I			5.10E+001	I		1.3E-003	C	1.2E-004	C	6.2E-005	C	1.1E-001	C	1.3E-002	C
N-NITROSODIPHENYLAMINE	86306			4.90E-003	I						1.4E+001	C	1.3E+000	C	6.4E-001	C	1.2E+003	C	1.3E+002	C
N-NITROSODIPROPYLAMINE	621647			7.00E+000	I						9.6E-003	C	8.9E-004	C	4.5E-004	C	8.2E-001	C	9.1E-002	C
N-NITROSO-N-ETHYLUREA	759739			1.40E+002	H						4.8E-004	C	4.5E-005	C	2.3E-005	C	4.1E-002	C	4.6E-003	C
N-NITROSO-N-METHYLETHYLAMINE	10595956			2.20E+001	I						3.0E-003	C	2.8E-004	C	1.4E-004	C	2.6E-001	C	2.9E-002	C
N-NITROSOPYRROLIDINE	930552			2.10E+000	I			2.10E+000	I		3.2E-002	C	3.0E-003	C	1.5E-003	C	2.7E+000	C	3.0E-001	C
M-NITROTOLUENE	99081	2.00E-002	E							y	1.2E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
O-NITROTOLUENE	88722	1.00E-002	H							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
P-NITROTOLUENE	99990	1.00E-002	H							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
NUSTAR	85509199	7.00E-004	I								2.6E+001	N	2.6E+000	N	9.5E-001	N	1.4E+003	N	5.5E+001	N
ORYZALIN	19044883	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
OXADIAZON	19666309	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
OXAMYL	23135220	2.50E-002	I								9.1E+002	N	9.1E+001	N	3.4E+001	N	5.1E+004	N	2.0E+003	N
OXYFLUORFEN	42874033	3.00E-003	I								1.1E+002	N	1.1E+001	N	4.1E+000	N	6.1E+003	N	2.3E+002	N

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PARAQUAT DICHLORIDE	1910425	4.50E-003	I								1.6E+002	N	1.6E+001	N	6.1E+000	N	9.2E+003	N	3.5E+002	N
PARATHION	56382	6.00E-003	H								2.2E+002	N	2.2E+001	N	8.1E+000	N	1.2E+004	N	4.7E+002	N
**PENTACHLOROBENZENE	608935	8.00E-004	I								2.9E+001	N	2.9E+000	N	1.1E+000	N	1.6E+003	N	6.3E+001	N
**PENTACHLORONITROBENZENE	82688	3.00E-003	I	2.60E-001	H						2.6E-001	C	2.4E-002	C	1.2E-002	C	2.2E+001	C	2.5E+000	C
PENTACHLOROPHENOL	87865	3.00E-002	I	1.20E-001	I						5.6E-001	C	5.2E-002	C	2.8E-002	C	4.8E+001	C	5.3E+000	C
PERMETHRIN	52645531	5.00E-002	I								1.9E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
PHENOL	108952	6.00E-001	I								2.2E+004	N	2.2E+003	N	8.1E+002	N	1.2E+006	N	4.7E+004	N
M-PHENYLENEDIAMINE	108452	6.00E-003	I								2.2E+002	N	2.2E+001	N	8.1E+000	N	1.2E+004	N	4.7E+002	N
O-PHENYLENEDIAMINE	95545			4.70E-002	H						1.4E+000	C	1.3E-001	C	6.7E-002	C	1.2E+002	C	1.4E+001	C
P-PHENYLENEDIAMINE	106503	1.90E-001	H								6.9E+003	N	6.9E+002	N	2.6E+002	N	3.9E+005	N	1.5E+004	N
2-PHENYLPHENOL	90437			1.90E-003	H						3.5E+001	C	3.3E+000	C	1.7E+000	C	3.0E+003	C	3.4E+002	C
PHOSPHINE	7803512	3.00E-004	I			8.60E-005	I				1.1E+001	N	3.1E-001	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
PHOSPHORIC ACID	7664382					2.90E-003	I						1.1E+001	N						
PHOSPHORUS (WHITE)	7723140	2.00E-005	I								7.3E-001	N	7.3E-002	N	2.7E-002	N	4.1E+001	N	1.6E+000	N
P-PHTHALIC ACID	100210	1.00E+000	H								3.7E+004	N	3.7E+003	N	1.4E+003	N	2.0E+006	N	7.8E+004	N
PHTHALIC ANHYDRIDE	85449	2.00E+000	I			3.43E-002	H				7.3E+004	N	1.3E+002	N	2.7E+003	N	4.1E+006	N	1.6E+005	N
POLYBROMINATED BIPHENYLS		7.00E-006	H	8.90E+000	H						7.5E-003	C	7.0E-004	C	3.5E-004	C	6.4E-001	C	7.2E-002	C !
POLYCHLORINATED BIPHENYLS	1336363			2.00E+000	I			2.00E+000	I		3.3E-002	C	3.1E-003	C	1.6E-003	C	2.9E+000	C	3.2E-001	C
AROCLOR-1016	12674112	7.00E-005	I	7.00E-002	I			7.00E-002	I		9.6E-001	C !	8.9E-002	C !	4.5E-002	C !	8.2E+001	C !	5.5E+000	N
AROCLOR-1221	11104282			2.00E+000	I			2.00E+000	I		3.3E-002	C	3.1E-003	C	1.6E-003	C	2.9E+000	C	3.2E-001	C
AROCLOR-1232	11141165			2.00E+000	I			2.00E+000	I		3.3E-002	C	3.1E-003	C	1.6E-003	C	2.9E+000	C	3.2E-001	C
AROCLOR-1242	53469219			2.00E+000	I			2.00E+000	I		3.3E-002	C	3.1E-003	C	1.6E-003	C	2.9E+000	C	3.2E-001	C
AROCLOR-1248	12672296			2.00E+000	I			2.00E+000	I		3.3E-002	C	3.1E-003	C	1.6E-003	C	2.9E+000	C	3.2E-001	C
AROCLOR-1254	11097691	2.00E-005	I	2.00E+000	I			2.00E+000	I		3.3E-002	C	3.1E-003	C	1.6E-003	C	2.9E+000	C	3.2E-001	C !
AROCLOR-1260	11096825			2.00E+000	I			2.00E+000	I		3.3E-002	C	3.1E-003	C	1.6E-003	C	2.9E+000	C	3.2E-001	C
POLYCHLORINATED TERPHENYLS	61788338			4.50E+000	E						1.5E-002	C	1.4E-003	C	7.0E-004	C	1.3E+000	C	1.4E-001	C
POLYNUCLEAR AROMATIC HYDROCARBONS:																				
**ACENAPHTHENE	83329	6.00E-002	I							y	3.7E+002	N	2.2E+002	N	8.1E+001	N	1.2E+005	N	4.7E+003	N
**ANTHRACENE	120127	3.00E-001	I							y	1.8E+003	N	1.1E+003	N	4.1E+002	N	6.1E+005	N	2.3E+004	N
BENZ[A]ANTHRACENE	56553			7.30E-001	E						9.2E-002	C	8.6E-003	C	4.3E-003	C	7.8E+000	C	8.7E-001	C
BENZO[B]FLUORANTHENE	205992			7.30E-001	E						9.2E-002	C	8.6E-003	C	4.3E-003	C	7.8E+000	C	8.7E-001	C
BENZO[K]FLUORANTHENE	207089			7.30E-002	E						9.2E-001	C	8.6E-002	C	4.3E-002	C	7.8E+001	C	8.7E+000	C
BENZO[A]PYRENE	50328			7.30E+000	I			3.10E+000	E		9.2E-003	C	2.0E-003	C	4.3E-004	C	7.8E-001	C	8.7E-002	C
CARBAZOLE	86748			2.00E-002	H						3.3E+000	C	3.1E-001	C	1.6E-001	C	2.9E+002	C	3.2E+001	C
CHRYSENE	218019			7.30E-003	E						9.2E+000	C	8.6E-001	C	4.3E-001	C	7.8E+002	C	8.7E+001	C
DIBENZ[A,H]ANTHRACENE	53703			7.30E+000	E						9.2E-003	C	8.6E-004	C	4.3E-004	C	7.8E-001	C	8.7E-002	C
DIBENZOFURAN	132649	4.00E-003	E							y	2.4E+001	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N
FLUORANTHENE	206440	4.00E-002	I								1.5E+003	N	1.5E+002	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
**FLUORENE	86737	4.00E-002	I							y	2.4E+002	N	1.5E+002	N	5.4E+001	N	8.2E+004	N	3.1E+003	N
INDENO[1,2,3-C,D]PYRENE	193395			7.30E-001	E						9.2E-002	C	8.6E-003	C	4.3E-003	C	7.8E+000	C	8.7E-001	C
2-METHYLNAPHTHALENE	91576	2.00E-002	E							y	1.2E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
**NAPHTHALENE	91203	2.00E-002	I			9.00E-004	I			y	6.5E+000	N	3.3E+000	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
**PYRENE	129000	3.00E-002	I							y	1.8E+002	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
PROMETON	1610180	1.50E-002	I								5.5E+002	N	5.5E+001	N	2.0E+001	N	3.1E+004	N	1.2E+003	N
PROMETRYN	7287196	4.00E-003	I								1.5E+002	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N

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Basis: C = Carcinogenic effects N = Noncarcinogenic effects = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfDi mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg	
PROPACHLOR	1918167	1.30E-002	I								4.7E+002	N	4.7E+001	N	1.8E+001	N	2.7E+004	N	1.0E+003	N
PROPANIL	709988	5.00E-003	I								1.8E+002	N	1.8E+00[illegible]	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
PROPARGITE	2312358	2.00E-002	I								7.3E+002	N	7.3E+00[illegible]	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
N-PROPYLBENZENE		1.00E-002	E							y	6.1E+001	N	3.7E+00[illegible]	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
PROPYLENE GLYCOL	57556	2.00E+001	H								7.3E+005	N	7.3E+004	N	2.7E+004	N	4.1E+007	N	1.6E+006	N
PROPYLENE GLYCOL, MONOETHYL ETHER	52125538	7.00E-001	H								2.6E+004	N	2.6E+003	N	9.5[illegible]+002	N	1.4E+006	N	5.5E+004	N
PROPYLENE GLYCOL, MONOMETHYL ETHER	107982	7.00E-001	H			5.70E-001	I				2.6E+004	N	2.1E+003	N	9.5E+002	N	1.4E+006	N	5.5E+004	N
PURSUIT	81335775	2.50E-001	I								9.1E+003	N	9.1E+002	N	3.4E+002	N	5.1E+005	N	2.0E+004	N
PYRIDINE	110861	1.00E-003	I								3.7E+001	N	3.7E+000	N	1.4E+000	N	2.0E+003	N	7.8E+001	N
QUINOLINE	91225			1.20E+001	H						5.6E-003	C	5.2E-004	C	2.6E-004	C	4.8E-001	C	5.3E-002	C
RDX	121824	3.00E-003	I	1.10E-001	I						6.1E-001	C	5.7E-002	C	2.9E-002	C	5.2E+001	C	5.8E+000	C
RESMETHRIN	10453868	3.00E-002	I								1.1E+003	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
**RONNEL	299843	5.00E-002	H								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
ROTENONE	83794	4.00E-003	I								1.5E+002	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N
SELENIOUS ACID	7783008	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
SELENIUM	7782492	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
SILVER	7440224	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
SIMAZINE	122349	5.00E-003	I	1.20E-001	H						5.6E-001	C	5.2E-002	C	2.6E-002	C	4.8E+001	C	5.3E+000	C
SODIUM AZIDE	26628228	4.00E-003	I								1.5E+002	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N
SODIUM DIETHYLDITHIOCARBAMATE	148185	3.00E-002	I	2.70E-001	H						2.5E-001	C	2.3E-002	C	1.2E-002	C	2.1E+001	C	2.4E+000	C
STRONTIUM, STABLE	7440246	6.00E-001	I								2.2E+004	N	2.2E+003	N	8.1E+002	N	1.2E+006	N	4.7E+004	N
STRYCHNINE	57249	3.00E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
STYRENE	100425	2.00E-001	I			2.86E-001	I			y	1.6E+003	N	1.0E+003	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746016			1.50E+005	H			1.50E+005	H		4.5E-007	C	4.2E-008	C	2.1E-008	C	3.8E-005	C	4.3E-006	C
**1,2,4,5-TETRACHLOROBENZENE	95943	3.00E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
1,1,1,2-TETRACHLOROETHANE	630206	3.00E-002	I	2.60E-002	I			2.60E-002	I	y	4.1E-001	C	2.4E-001	C	1.2E-001	C	2.2E+002	C	2.5E+001	C
1,1,2,2-TETRACHLOROETHANE	79345	6.00E-002	E	2.00E-001	I			2.00E-001	I	y	5.3E-002	C	3.1E-002	C	1.6E-002	C	2.9E+001	C	3.2E+000	C
TETRACHLOROETHENE	127184	1.00E-002	I	5.20E-002	E	1.4E-001	E	2.00E-003	E	y	1.1E+000	C	3.1E+000	C	6.1E-002	C	1.1E+002	C	1.2E+001	C
2,3,4,6-TETRACHLOROPHENOL	58902	3.00E-002	I								1.1E+003	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
**P,A,A,A-TETRACHLOROTOLUENE	5216251			2.00E+001	H						3.3E-003	C	3.1E-004	C	1.6E-004	C	2.9E-001	C	3.2E-002	C
1,1,1,2-TETRAFLUOROETHANE	811972					2.29E+001	I			y	1.7E+005	N	8.4E+004	N						
**TETRAHYDROFURAN	109999	2.00E-002	E	7.6E-003	E	8.6E-002	E	6.8E-003	E		8.8E+000	C	9.2E-001	C	4.2E-001	C	7.5E+002	C	8.4E+001	C
TETRYL	479458	1.00E-002	H								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
THALLIC OXIDE	1314325	7.00E-005	W								2.6E+000	N	2.6E-001	N	9.5E-002	N	1.4E+002	N	5.5E+000	N
THALLIUM	7440280	7.00E-005	O								2.6E+000	N	2.6E-001	N	9.5E-002	N	1.4E+002	N	5.5E+000	N
THALLIUM ACETATE	563688	9.00E-005	I								3.3E+000	N	3.3E-001	N	1.2E-001	N	1.8E+002	N	7.0E+000	N
THALLIUM CARBONATE	6533739	8.00E-005	I								2.9E+000	N	2.9E-001	N	1.1E-001	N	1.6E+002	N	6.3E+000	N
THALLIUM CHLORIDE	7791120	8.00E-005	I								2.9E+000	N	2.9E-001	N	1.1E-001	N	1.6E+002	N	6.3E+000	N
THALLIUM NITRATE	10102451	9.00E-005	I								3.3E+000	N	3.3E-001	N	1.2E-001	N	1.8E+002	N	7.0E+000	N
THALLIUM SULFATE (2:1)	7446186	8.00E-005	I								2.9E+000	N	2.9E-001	N	1.1E-001	N	1.6E+002	N	6.3E+000	N
THIOBENCARB	28249776	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
TIN	7440315	6.00E-001	H								2.2E+004	N	2.2E+003	N	8.1E+002	N	1.2E+006	N	4.7E+004	N

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Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfD mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg	
TITANIUM	7440326	4.00E+000	E			8.60E-003	E				1.5E+005	N	3.1E+001	N	5.4E+003	N	8.2E+006	N	3.1E+005	N
TITANIUM DIOXIDE	13463677	4.00E+000	E			8.60E-003	E				1.5E+005	N	3.1E+001	N	5.4E+003	N	8.2E+006	N	3.1E+005	N
TOLUENE	108883	2.00E-001	I			1.14E-001	I			y	7.5E+002	N	4.2E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
TOLUENE-2,4-DIAMINE	95807			3.20E+000	H						2.1E-002	C	2.0E-003	C	9.9E-004	C	1.8E+000	C	2.0E-001	C
TOLUENE-2,5-DIAMINE	95705	6.00E-001	H								2.2E+004	N	2.2E+003	N	8.1E+002	N	1.2E+006	N	4.7E+004	N
TOLUENE-2,6-DIAMINE	823405	2.00E-001	H								7.3E+003	N	7.3E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
P-TOLUIDINE	106490			1.90E-001	H						3.5E-001	C	3.3E-002	C	1.7E-002	C	3.0E+001	C	3.4E+000	C
**TOXAPHENE	8001352			1.10E+000	I			1.10E+000	I		6.1E-002	C	5.7E-003	C	2.9E-003	C	5.2E+000	C	5.8E-001	C
**,2,4-TRIBROMOBENZENE	615543	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
TRIBUTYLTIN OXIDE	56359	3.00E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
2,4,6-TRICHLOROANILINE	634935			3.40E-002	H						2.0E+000	C	1.8E-001	C	9.3E-002	C	1.7E+002	C	1.9E+001	C
1,2,4-TRICHLOROBENZENE	120821	1.00E-002	I			5.70E-002	H			y	1.9E+002	N	2.1E+002	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
1,1,1-TRICHLOROETHANE	71556	2.00E-002	E			2.86E-001	E			y	5.4E+002	N	1.0E+003	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
1,1,2-TRICHLOROETHANE	79005	4.00E-003	I	5.70E-002	I			5.60E-002	I	y	1.9E-001	C	1.1E-001	C	5.5E-002	C	1.0E+002	C	1.1E+001	C
TRICHLOROETHENE	79016	6.00E-003	E	1.10E-002	E			6.00E-003	E	y	1.6E+000	C	1.0E+000	C	2.9E-001	C	5.2E+002	C	5.6E+001	C !
TRICHLOROFLUOROMETHANE	75694	3.00E-001	I			2.00E-001	A			y	1.3E+003	N	7.3E+002	N	4.1E+002	N	6.1E+005	N	2.3E+004	N
2,4,5-TRICHLOROPHENOL	95954	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
2,4,6-TRICHLOROPHENOL	88062			1.10E-002	I			1.00E-002	I		6.1E+000	C	6.3E-001	C	2.9E-001	C	5.2E+002	C	5.8E+001	C
2,4,5-T	93765	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93721	8.00E-003	I								2.9E+002	N	2.9E+001	N	1.1E+001	N	1.6E+004	N	6.3E+002	N
1,1,2-TRICHLOROPROPANE	598776	5.00E-003	I							y	3.0E+001	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
1,2,3-TRICHLOROPROPANE	96184	6.00E-003	I	7.00E+000	H					y	1.5E-003	C	8.9E-004	C	4.5E-004	C	8.2E-001	C	9.1E-002	C
1,2,3-TRICHLOROPROPENE	96195	5.00E-003	H							y	3.0E+001	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76131	3.00E+001	I			8.60E+000	H			y	5.9E+004	N	3.1E+004	N	4.1E+004	N	6.1E+007	N	2.3E+006	N
1,2,4-TRIMETHYLBENZENE	95636	5.00E-002	E			1.70E-003	E			y	1.2E+001	N	6.2E+000	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
1,3,5-TRIMETHYLBENZENE	108678	5.00E-002	E			1.70E-003	E			y	1.2E+001	N	6.2E+000	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
TRIMETHYL PHOSPHATE	512561			3.70E-002	H						1.8E+000	C	1.7E-001	C	8.5E-002	C	1.5E+002	C	1.7E+001	C
1,3,5-TRINITROBENZENE	99354	3.00E-002	I								1.1E+003	N	1.1E+002	N	4.1E+001	N	6.1E+004	N	2.3E+003	N
2,4,6-TRINITROTOLUENE	118967	5.00E-004	I	3.00E-002	I						2.2E+000	C !	2.1E-001	C !	1.1E-001	C !	1.9E+002	C !	2.1E+001	C !
URANIUM (SOLUBLE SALTS)		3.00E-003	I								1.1E+002	N	1.1E+001	N	4.1E+000	N	6.1E+003	N	2.3E+002	N
VANADIUM	7440622	7.00E-003	H								2.6E+002	N	2.6E+001	N	9.5E+000	N	1.4E+004	N	5.5E+002	N
VANADIUM PENTOXIDE	1314621	9.00E-003	I								3.3E+002	N	3.3E+001	N	1.2E+001	N	1.8E+004	N	7.0E+002	N
VANADIUM SULFATE	16785812	2.00E-002	H								7.3E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
VINCLOZOLIN	50471448	2.50E-002	I								9.1E+002	N	9.1E+001	N	3.4E+001	N	5.1E+004	N	2.0E+003	N
VINYL ACETATE	108054	1.00E+000	H			5.71E-002	I			y	4.1E+002	N	2.1E+002	N	1.4E+003	N	2.0E+006	N	7.8E+004	N
VINYL CHLORIDE	75014			1.90E+000	H			3.00E-001	H	y	1.9E-002	C	2.1E-002	C	1.7E-003	C	3.0E+000	C	3.4E-001	C
WARFARIN	81812	3.00E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
M-XYLENE	108383	2.00E+000	H							y	1.2E+004	N	7.3E+003	N	2.7E+003	N	4.1E+006	N	1.6E+005	N
O-XYLENE	95476	2.00E+000	H							y	1.2E+004	N	7.3E+003	N	2.7E+003	N	4.1E+006	N	1.6E+005	N
P-XYLENE	106423									y										
XYLENES	1330207	2.00E+000	I							y	1.2E+004	N	7.3E+003	N	2.7E+003	N	4.1E+006	N	1.6E+005	N
ZINC	7440666	3.00E-001	I								1.1E+004	N	1.1E+003	N	4.1E+002	N	6.1E+006	N	2.3E+004	N
ZINC PHOSPHIDE	1314847	3E-004	I								1.1E+001	N	1.1E+000	N	4.1E-001	N	6.1E+002	N	2.3E+001	N
ZINEB	12122677	5E-002	I								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+006	N	3.9E+003	N